The Effect of Motivational Interviewing on Stroke Risk in Adults

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Abstract

Stroke is the fifth leading cause of death in the United States, and there are physical, economic, and emotional consequences for patients and their families. Finding effective ways to reduce risk factors and prevent stroke is essential. The purpose of this one cohort pretest-posttest project was to determine if evidence-based motivational interviewing decreases 10-year stroke risk in patients 55 years and older in the primary care setting. A convenience sample was utilized at a primary care clinic in northwest Missouri. The evidence-based intervention that was implemented is motivational interviewing, a technique of counseling that helps patients identify their own motivations and barriers for behavior change. The primary outcome was the patients' 10-year stroke risk, and secondary outcomes included body mass index, smoking status, blood pressure, and blood lipid measurements. Mean values for stroke risk, BMI, HDL, LDL, and systolic BP were successfully improved after the intervention, but the differences were not statistically significant. With stroke being the most preventable cause of disability in the United States, finding effective prevention strategies is valuable on both a national and local level.

Keywords: stroke prevention, primary prevention, stroke risk factor reduction, motivational interviewing

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Stroke is one of the main causes of death and disability in the United States, and the incidence increases with age. While increasing age is a nonmodifiable risk factor for stroke, there is a multitude of modifiable risk factors that can be addressed to reduce an individual's risk for stroke (see Appendix A for a definition of terms).

Significance

Stroke is the fifth leading cause of death in the U.S., with an incidence of about 795,000 deaths per year (American Heart Association, 2016). When patients survive a stroke, the physical, economic, and emotional burdens on the patient and their families can be crippling (Meschia et al., 2014; Romero, Morris, & Pikula, 2008). In patients 65 years and older, 6 months after having a stroke, 26% are completely dependent in their everyday functioning, and 46% have cognitive deficits (Meschia et al., 2014). More than half of people consider a major stroke to be worse than death (Meschia et al., 2014), so finding effective ways to reduce risk factors and prevent stroke is essential.

In addition to the significant effect of strokes on individuals and their families, there is a far-reaching impact on communities and the U.S. healthcare system. The monetary costs include short-term expenses like acute hospital stays, and long-term direct and indirect expenses like nursing home care and reduced productivity (Demaerschalk, Hwang, & Leung, 2010). The lifetime cost of first strokes in the U.S. in 1990 was $40.6 billion (Taylor et al., 1996). As both the incidence of stroke and healthcare costs are rising, the total financial burden of stroke is expected to reach $185 billion in 2030 (Benjamin et al., 2017).

A healthy lifestyle would potentially decrease five-year stroke incidence rates from 153 to 94 per 100,000 for women, and 261 to 161 per 100,000 for men (Tikk et al., 2014). The significant reduction of stroke by lifestyle modification presents the question of why a largely preventable disease is a top cause of death and disability in the U.S. (American Heart Association, 2016), and more importantly, how to best address this issue.

Local Issue

Not only is stroke a national issue, but a local one as well. This project was implemented in Warrensburg, Missouri which is located about 60 miles southeast of Kansas City. This is an area where more rigorous stroke prevention efforts are needed, as stroke incidence and mortality rates in the surrounding states of Missouri and Kansas are consistently higher than national rates (Centers for Disease Control and Prevention, 2016). In 2014, the stroke mortality rate for Missouri was 41.0 and for Kansas was 39.0, while the overall stroke mortality rate in the U.S. was lower at 36.5 (Centers for Disease Control and Prevention, 2016).

Diversity Considerations

There are several components of diversity and culture that were considered for this project. The population focus was solely on adults aged 55 years and older, which presents a unique set of health implications. Chronic diseases and comorbidities are a major concern for this population, which contributes to a decreased quality of life (Office of Disease Prevention and Health Promotion, 2018). As adults age, they are also less likely to participate in physical activity and other lifestyle modifications, further impacting their chronic disease states (Office of Disease Prevention and Health Promotion, 2018).

The local diversity was an important consideration to the development of this project. The distribution of race in the geographical area surrounding the project site is 81.2% Caucasian (compared to 61.5% nationwide), 8.2% African-American (compared to 12.3% nationwide), and less than 3% Hispanic (compared to 17.6% nationwide; DataUSA, n.d.). The poverty rate in this area is 25.3%, compared to 14.7% nationwide (DataUSA, n.d.). This is an essential consideration because lower socioeconomic status is associated with less education, lower health literacy, lack of health insurance coverage, negative experiences with the healthcare system, and overall poorer outcomes (Knobf et al., 2007).

Problem and Purpose

Problem Statement

Stroke is the most preventable cause of disability in the U.S., with 10 potentially modifiable risk factors accounting for 90% of stroke risk (American Heart Association, 2016; Meschia et al., 2014). Therefore, finding effective methods to modify these risk factors will decrease stroke risk and prevent subsequent disability.

Intended Improvement and Purpose

The American Heart Association (AHA) recognized that primary prevention practices related to vascular health are underused in the general practice setting (Meschia et al., 2014). It is important for researchers to find time-efficient, cost-effective ways to address primary stroke prevention rather than focusing solely on secondary prevention (Meschia et al., 2014). The purpose of this DNP project was to determine if evidence-based motivational interviewing (MI) decreases 10-year stroke risk in patients 55 years and older in the primary care setting.

Facilitators and Barriers

There are many facilitators that contributed to the successful completion of this project (see Appendix B for a logic model). The primary care clinic that served as the setting for the project had a professional, supportive staff, with the primary facilitators being the office manager, the clinical educator, and the nurse practitioner who was the primary care provider for the patients. The economic component of this project also facilitated successful completion as the student investigator used self-funding rather than seeking grant funds. In addition, the project did not require any additional resources from the clinic.

There were also barriers that affected the completion of this project. Resistance to change is a common barrier that is present within an organization. The student investigator that implemented the project was not a staff member at the clinic, which likely affected the amount of time and energy the staff put into this change. In addition, the short time frame may have affected the staff's outlook on the project as they may not choose to sustain the change beyond the project time frame.

There are additional factors that affected the sustainability of the intervention during the project. Factors that enhanced sustainability included the intervention being implemented at the patient's regularly scheduled clinic appointment and the large number of older adult patients that this clinic serves. Factors that inhibited sustainability included pharmacologic treatment being implemented in conjunction with lifestyle modifications and the necessity of a follow-up appointment within the project time frame.

Review of the Evidence

Inquiry

In patients 55 years and older, does engaging in motivational interviewing (MI) regarding modifiable stroke risk factors compared with not engaging in MI reduce the 10-year stroke risk within four months in the primary care setting?

Search Strategies

The University of Missouri – Kansas City (UMKC) Health Sciences Library, Google Scholar, CINHAHL, and PubMed were utilized to find articles relating to the inquiry. Key search words and phrases included primary stroke prevention, stroke risk reduction, motivational interviewing, motivational interviewing for lifestyle modification, motivational interviewing for stroke prevention, preventive health behaviors, and motivational interviewing for health behaviors. Studies were excluded if they were written in a language other than English, published more than 10 years ago, focused solely on secondary stroke prevention, or if the intervention involved pharmacologic therapy only. Inclusion criteria included studies with participants aged 55 years and older. This resulted in 20 articles to be included in the synthesis of evidence (see Appendix C for a review of evidence table).

A level of evidence was assigned to each study based on the research design (Melnyk & Fineout-Overholt, 2015, adapted). One study was a level I evidence-based practice guideline (EBPG). Three studies were level I systematic reviews (SRs) of randomized controlled trials (RCTs). Two studies were level II SRs of non-RCTs. Four studies were level II RCTs. One study was a level III SR containing various types of quantitative studies. Six studies were level IV case-control or cohort studies. Two studies were level VI quantitative descriptive studies. Finally, one study was a level VII expert opinion.

Synthesis of Evidence

During the literature review, three main evidence topics emerged: stroke prevention, motivational interviewing, and health behavior change. A thorough synthesis of the evidence surrounding these evidence topics provided support for the inquiry.

Stroke prevention. Nine studies were categorized under the evidence topic of stroke prevention. The primary objective of these studies was to examine the effects of various modifiable risk factors on the likelihood of suffering a stroke. These studies provided the most direct supportive evidence for the inquiry.

A common theme identified in the literature was the focus on primary prevention, which is the best approach to decreasing the global burden of stroke (Meschia et al., 2014). Many studies contained specific exclusion criteria so that the results would reflect primary prevention rather than secondary. By excluding participants who had previously suffered a stroke, these authors were able to identify a population that could be targeted by primary prevention efforts regarding lifestyle modifications (Larsson et al., 2015; O'Donnell et al., 2010; Sullivan et al., 2008; Tikk et al., 2014). Another theme recognized in the literature was the individualization of risk assessment and prevention measures. Using a reliable stroke risk assessment tool is an effective method of determining a patient's individual risk of stroke (Meschia et al., 2014). Evidence also suggests that when interventions are individualized and comprehensive, patients are more satisfied and likely to implement positive lifestyle modifications (Meschia et al., 2014; Niewada & Michel, 2016; Sullivan et al., 2008; Tikk et al., 2014). The vast difference in individual stroke risk between someone with high-risk behaviors and someone with low-risk behaviors suggests the need for intensive individualized primary prevention measures (Meschia et al., 2014; Tikk et al., 2014).

Many studies reported using interventions that positively impacted stroke risk factors, but strong evidence is still lacking for specific interventions that may decrease overall stroke risk (Brown et al., 2015; Niewada & Michel, 2016; O'Donnell et al., 2010). One study that incorporated a multicomponent education intervention reported a significant effect on diet, but no significant effect on other outcomes such as blood pressure (BP), physical activity, weight, or lipid levels (Brown et al., 2015). While there is a well-documented relationship between physical activity and decreased stroke risk (Chiuve et al., 2008; Meschia et al., 2014; O'Donnell et al., 2010), the exact amount and type of exercise that should be performed is not clearly defined

(Niewada & Michel, 2016). Similarly, healthy diets such as the Mediterranean diet, DASH diet, and one rich in fruits and vegetables have demonstrated decreased stroke risk (Chiuve et al., 2008; Meschia et al., 2014; O'Donnell et al., 2010), but the effect of specific vitamins, antioxidants, and fatty acids are not well studied (Niewada & Michel, 2016).

The outcome that was most frequently measured was the incidence of stroke which was usually measured through medical record review (Chiuve et al., 2008; Larsson, Akesson, & Wolk, 2015; O'Donnell et al., 2010; Siddeswari et al., 2016). The majority of studies identified both ischemic and hemorrhagic strokes as outcomes (Chiuve et al. 2008; Larsson et al., 2015; O'Donnell et al., 2010; Siddeswari et al., 2016; Tikk et al. 2014). The results of these studies overwhelmingly indicated that many strokes could have been prevented through lifestyle modifications (Chiuve et al., 2008; O'Donnell et al., 2010; Tikk et al., 2014). The most commonly identified modifiable risk factors for both ischemic and hemorrhagic stroke were lipid levels, hypertension, smoking, body weight or body mass index (BMI), diet, and physical activity (Chiuve et al., 2008; Meschia et al., 2014; O'Donnell et al., 2010). In fact, O'Donnell et al. (2010) found that these risk factors alone account for 80% of global stroke risk. Of these, hypertension was commonly identified as the most significant and well-studied modifiable risk factor for stroke (Meschia et al., 2014; O'Donnell et al., 2010; Siddeswari et al., 2016).

The evidence suggests that a combination of lifestyle modifications has a stronger potential to decrease stroke risk than any single modification (Chiuve et al., 2008; Larsson et al., 2015; Tikk et al., 2014). Many studies used multivariate statistical methods to determine risk scores and the preventive potential of stroke based on several risk factors (Chiuve et al., 2008; Larsson et al., 2015; O'Donnell et al., 2010; Tikk et al., 2014). It can be concluded that interventions should address multiple risk factors rather than target only one factor (Niewada & Michel, 2016).

Motivational interviewing. Seven articles were categorized into the evidence topic of motivational interviewing (MI). MI is commonly defined as a patient-centered method of counseling that promotes a behavior change by exploring an individual's unique reasons and motivation for change (Barker-Collo et al., 2015; Lundahl et al., 2013; Martins & McNeil, 2009). The main objective of these studies was to determine the effectiveness of MI on various health-related behaviors.

The predominant theme found in the literature surrounding MI is the focus on lifestyle modification which can reduce the risk for many chronic diseases including heart disease and stroke (Barker-Collo et al., 2015; Lee, Choi, Yum, Doris, & Chair, 2016; Ma, Zhou, Zhou, & Huang, 2014; Thompson et al., 2011). Specific goals of MI include increasing awareness of risks and the potential consequences of health behaviors, and assessing readiness to modify these risky lifestyle choices (Barker-Collo et al., 2015; Martins & McNeil, 2009; Morton et al., 2015).

The most common study design found in the literature involved an intervention group that participated in MI compared with a control group that received traditional advice or the usual care (Barker-Collo et al., 2015; Lee et al., 2016; Lundahl et al., 2013; Ma et al., 2014; Martins & McNeil, 2009; Thompson et al., 2011). MI interventions were usually completed either face-to-face or over the phone (Barker-Collo et al., 2015; Lee et al., 2016; Lundahl et al., 2013; Ma et al., 2014; Morton et al., 2015). The average length of time of MI sessions ranged from 11 to 106 minutes (Lundahl et al., 2013; Morton et al., 2015), and the frequency ranged from a single session to more than eight sessions, with most studies reporting one to four sessions (Barker-Collo et al., 2015; Lee et al., 2016; Ma et al., 2014; Morton et al., 2015).

Overall, two or more sessions demonstrated more effectiveness than a single session (Morton et al., 2015; Thompson et al., 2011), but further research is needed on this topic (Martins & McNeil, 2009). MI interventions were delivered by a variety of trained healthcare professionals, but nurses and mental health professionals were the most common (Lee et al., 2016; Lundahl et al., 2013; Ma et al., 2014). Many studies failed to adequately describe the content of the MI sessions (Morton et al., 2015). Among those that included details about the MI content, common components were self-awareness, goal-setting, and action planning (Ma et al., 2014; Morton et al., 2015).

The effectiveness of MI has been studied on a wide variety of physical and psychosocial outcomes. The most common outcomes found in the literature were physical activity, diet, alcohol use, BP, lipid levels, smoking, and body weight (Barker-Collo et al., 2015; Lee et al., 2016; Lundahl et al., 2013; Ma et al., 2014; Martins & McNeil, 2009; Morton et al., 2015; Thompson et al., 2011). While many physiological outcomes were able to be measured objectively, most studies relied on self-report for outcomes such as diet, physical activity, and smoking.

Overall, the majority of studies were found to have statistically significant behavioral outcomes related to MI interventions (Lundahl et al., 2013; Martins & McNeil, 2009; Morton et al., 2015; Thompson et al., 2011). Specifically, MI was found to have a significantly positive effect on smoking (Lee et al., 2016; Lundahl et al., 2013), body weight (Lundahl et al., 2013; Thompson et al., 2011), BP (Ma et al. 2014), diet (Martins & McNeil, 2009; Thompson et al., 2011), and physical activity (Martins & McNeil, 2009; Thompson et al., 2011). However, some studies demonstrated conflicting findings; MI did not always result in statistically significant changes regarding BP (Barker-Collo et al. 2015; Lee et al., 2016) or lipid levels (Barker-Collo et al., 2016). In conclusion, MI is found to be a robust, cost-effective intervention that can be effectively delivered by various medical professionals with or without supervision, to nearly any population, regarding a multitude of health behaviors (Barker-Collo et al., 2015; Lundahl et al., 2013).

Health behavior change. Four articles were categorized into the evidence topic of health behavior change. The common aim of these studies was to investigate the motivational factors that influence whether or not a person changes a health behavior (Epton & Harris, 2008; Jackson, Steptoe, & Wardle, 2015; Johnson, Scott-Sheldon, & Carey, 2010; Newsom et al., 2011). This is relevant to the inquiry as the proposed MI intervention also examines each individual's unique reasons for change (Lundahl et al., 2013; Martins & McNeil, 2009). Individuals may choose to change their behavior for many reasons: to feel better physically or emotionally, decrease their risk of disease, or reduce their risk of death (Jackson et al., 2015; Johnson et al., 2010). Exploring these individual motivations is important when addressing health behavior change (Epton & Harris, 2008).

The most common behavioral outcomes that were targeted in these studies were physical activity (Jackson et al., 2015; Johnson et al., 2010; Newsom et al., 2011), smoking (Jackson et al., 2015; Newsom et al., 2011), and diet (Epton & Harris, 2008; Johnson et al., 2010). These outcomes are particularly relevant to the inquiry as they represent some of the most common modifiable risk factors for stroke (Tikk et al., 2014). All studies included the use of self-report as an outcome measurement tool (Epton & Harris, 2008; Jackson et al., 2015; Johnson et al., 2010; Newsom et al., 2011). Objective outcome measurements were also utilized when possible, such as height, weight, and BMI (Jackson et al., 2015; Johnson et al., 2010).

Overall, brief behavioral interventions have been shown to promote positive health behavior changes (Johnson et al., 2010; Newsom et al., 2011). The most successful behavioral interventions were targeted at stress management, participation in health services, diet, and exercise, all of which demonstrated significantly successful results in meta-analyses (Johnson et al., 2010). Older adults were more likely to make positive changes than younger people (Johnson et al., 2010; Newsom et al., 2011), and females were more likely to make changes than males (Johnson et al., 2010). Additional interventions that led to positive health behavior changes included self-affirmation practices (Epton & Harris, 2008) and an individual's partner adopting the new healthy behavior, which indicated strong social support (Jackson et al., 2015). These findings are important to consider as they could be easily integrated into a brief behavioral intervention such as MI.

There are also several factors that did not demonstrate a positive effect on health behavior change. Interventions that were longer in length did not significantly differ from the usual care (Johnson et al., 2010; Newsom et al., 2011), and studies with a greater number of participants demonstrated smaller effect sizes (Johnson et al., 2010). The literature also revealed that patients who were newly diagnosed with a chronic disease generally did not embrace healthier behaviors (Newsom et al., 2011). Therefore, it can be concluded that health professionals should take a proactive approach to reduce risk factors rather than waiting until a patient has already been diagnosed with a chronic disease (Johnson et al., 2010; Newsom et al., 2011).

Theory

The Health Belief Model (HBM) was used to guide this project (see Appendix D for a theory application diagram). This model is especially useful when applied to preventive health actions (Rosenstock, 1966), which was appropriate for this project. It has been used to guide interventions for a variety of health promotion topics such as smoking, diet, and exercise (McEwen & Wills, 2014; Rosenstock, 1974). The HBM successfully incorporated the key concepts of lifestyle modification and individualized care which were essential to the project. The HBM concepts of perceived susceptibility, severity, benefits, and barriers all correspond with individualized care because they are unique to each patient and must be addressed on an individual level. This was achieved through the evidence-based MI intervention. The other concept, lifestyle modification, corresponds with the ultimate focus of the HBM which is behavior change (McEwen & Wills, 2014).

Methods

IRB and Site

The primary Institutional Review Board (IRB) for this project was the UMKC IRB, and the project was categorized as Not Human Subjects Research (see Appendix E for the IRB approval letter). IRB approval was granted in October 2018 (see Appendix F for the project timeline). The site of the project was a primary care clinic associated with a rural hospital in northwest Missouri.

Ethical Considerations

One ethical consideration that applied to this project was the principle of autonomy. While it may be clear to healthcare professionals why risk factor reduction is important, if a patient chooses not to make stroke prevention a priority, the provider must respect that autonomous decision (Peirce & Smith, 2013). Another consideration was the protection of participants in vulnerable populations. Vulnerable populations include older adults, physically or mentally disabled, and those of low socioeconomic status (Levesque, Harris, & Russell, 2013). Obtaining consent from these participants was done carefully to ensure that all components of informed consent were fully understood. The student investigator had no conflicts of interest to disclose.

Funding

Grant funding was not sought for this project as the only expense was a minor fee for the online MI training course (see Appendix G for a cost table). Therefore, the project was self-funded by the student investigator.

Setting and Participants

The setting for the project was a primary care clinic in northwest Missouri. Convenience sampling was utilized, and participants included those who were 55 years old or older that attended this clinic. Participants were excluded if they had a history of any type of stroke, as this project was designed to address primary prevention. All patients that consented were included in the study. While the expected number of participants was approximately 28, this number was not met.

Evidence-Based Intervention

The evidence-based intervention that was implemented is MI, a technique of counseling that assists patients in identifying the motivations and barriers that influence their likelihood of changing a behavior (Lundahl et al., 2013; Martins & McNeil, 2009; see Appendix H for an intervention flow diagram). The behaviors that were addressed were those that increase patients' risk of stroke, which can be different for each patient. Such behaviors included nutrition, physical activity, weight loss, smoking, and medication adherence. The goal was that the patient would overcome their ambivalence to change and would implement healthier lifestyle choices that would consequently decrease their stroke risk (see Appendix I for sample intervention materials).

Recruitment. The first step in the intervention was recruitment of participants. This took place from October to November 2018. The student investigator used convenience sampling to recruit participants that met the inclusion and exclusion criteria. A brief chart review assisted in identifying patients who met this criteria. As patients were seen by their provider at their regularly scheduled clinic appointment, the student investigator approached them to explain the project (see Appendix J for a sample recruitment script).

Obtain consent. The next step was to obtain verbal consent from the participants. The student investigator completed this step at the same time as recruitment, at the patient's clinic appointment after the project had been verbally explained and all questions answered.

Pre-intervention data collection. The next step was to collect baseline data before the MI intervention occurred. The student investigator reviewed participants' charts to obtain data regarding demographics, BMI, blood lipid levels, BP, and smoking status. This step also occurred during the patient's appointment as the student investigator confirmed this data while face-to-face with the patient.

Motivational interviewing intervention. The next step was for the student investigator to lead the MI intervention which also occurred during the patient's clinic appointment. The student investigator used the American College of Cardiology (ACC) Atherosclerotic Cardiovascular Disease (ASCVD) Risk Estimator to obtain the patient's individualized 10-year stroke risk based on the pre-intervention data that was collected. This risk score was shared with the patient, followed by a brief MI session that focused on behavior and lifestyle changes that could decrease this risk. Each session lasted approximately 15 minutes.

Post-intervention data collection. The final step was for the student investigator to collect data four months after the MI intervention. This occurred from February to March 2019.

The student investigator performed chart reviews to obtain data regarding participants' most recently charted BMI, lipid levels, BP, and smoking status. The ASCVD Risk Estimator was used again to obtain each participant's individualized 10-year stroke risk. This data was then statistically analyzed to determine if the MI intervention was effective.

Change Process and Evidence-based Practice Model

The change process theory that was used in this project is Kotter and Cohen's Model of Change, which focuses on appealing to staff members' emotions in order to facilitate change (Melnyk & Fineout-Overholt, 2011). The steps in this model include urgency, team selection, vision and strategy, communicating the vision, empowerment, interim successes, ongoing persistence, and nourishment (Melnyk & Fineout-Overholt, 2011).

The EBP model that was chosen to guide this project is the Stetler model because the phases closely align with the project implementation. These phases include preparation, validation of the evidence, comparative evaluation (evidence critique), implementation, and evaluation (Schaffer, Sandau, & Diedrick, 2012). The Stetler model is typically applied to an individual practitioner rather than a group of researchers (Schaffer et al., 2012), which is appropriate as the student investigator implemented this project.

Sustainability

It may be difficult for the clinic to sustain the change that this project introduced because delivering the MI sessions requires specific training. However, the general use of brief behavioral interventions has shown a multitude of positive health behavior changes (Johnson et al., 2010; Newsom et al., 2011). If a provider, counselor, or social worker is interested in being trained to deliver MI sessions, the student investigator could provide them with resources to complete this training. In addition, it would be beneficial for the clinic to continue to incorporate brief behavioral interventions as an adjunct to routine care.

Study Design

The study design for this pilot project was quasi-experimental and utilized a single intervention cohort, pre- and post-evaluation. The primary outcome, 10-year stroke risk, was measured before and after the intervention. The intervention was a single MI session.

Validity

This project contained potential threats to internal and external validity. A threat to internal validity that is present with this type of research design is the inability to attribute causation to the intervention rather than some other factor (Terry, 2018). This threat was minimized by excluding patients from data analysis who underwent a change in their antihypertensive medication regimen within the project time frame. Attrition was also a threat to this project but was minimized as post-intervention data were obtained from chart review rather than attempting to contact the participants. Internal validity was further enhanced by the student investigator being the only person delivering the MI intervention and collecting data. There were threats to external validity that may limit generalizability of this project. Selection bias was a threat due to the convenience sampling that was used. The sample of participants from the project site may not have been representative of the general population due to demographic factors such as race.

Outcomes

The primary outcome for this project was 10-year stroke risk. Secondary outcomes included BMI, total cholesterol level, HDL level, LDL level, systolic BP, and smoking status (see Appendix K for the data collection template that was used).

Measurement Instruments

The primary outcome, 10-year stroke risk, was measured using the ACC ASCVD Risk Estimator, which is available on the internet or as a cell phone application (see Appendix L for tool). It is validated for use in adults 40 years old and older. This tool is based on the risk equation introduced in the 2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk, and the validity and reliability have been demonstrated in multiple studies, with C-statistics consistently greater than 0.70 (Goff et al., 2013; Muntner et al., 2014). While this tool focuses on atherosclerotic cardiovascular events in general rather than solely stroke, it is the only relevant tool that has been consistently validated in the literature and therefore was appropriate for use in this project. This tool is available in the public domain and permission was not required for its use in this project.

The secondary outcome of BP was measured using a sphygmomanometer, which is considered a valid and reliable tool for measuring BP. However, calibration of the sphygmomanometer, incorrect cuff size, and the skill of the nurse taking the measurement are all factors that could have affected validity and reliability. Other secondary outcomes including total cholesterol, HDL, and LDL levels were measured through lab, which is also considered a valid and reliable method. Smoking status was measured through self-report and chart review.

Quality of Data

The measures chosen for this project have been frequently used in similar studies. The ACC ASCVD Risk Estimator has been utilized in many studies since it was first introduced in the 2013 ACC/AHA guideline. A priori power analysis was calculated using GPower for the Wilcoxon signed rank test using an effect size of .5, alpha of .05, and power of .8 which resulted in a desired sample size of 28 participants. The project data can be compared to published data because there have been multiple studies that have evaluated the effect of MI on physiologic health outcomes such as BP and lipid levels (Barker-Collo et al., 2015; Lee et al., 2016; Ma et al., 2014). A threat to the quality of data was missing data such as lipid levels, as the patient may not have had their blood drawn within the project time frame.

Analysis Plan

The main statistical analysis used for this project was the Wilcoxon signed rank test. While the paired t-test was originally going to be used for data analysis, the Wilcoxon test was chosen instead because of the small sample size and parametric assumptions violated. Smoking status was the only outcome represented by nominal data and was therefore analyzed using McNemar test. Each outcome was measured once before the intervention and once after the intervention; this data was used to draw inferences to determine if the MI intervention produced statistically significant outcomes. In addition, descriptive statistics were used to summarize the demographic characteristics of the sample (see Appendix M for the statistical analysis table templates that were used).

Results

Setting and Participants

The student investigator began recruitment and intervention implementation at the project site on October 16, 2018. In order to allow for adequate follow-up time, recruitment and implementation ended on November 30, 2018. Follow-up data were collected after 4 months, ending on March 30, 2019.

A total of 25 participants completed the project intervention. Out of these 25 participants, 17 were eligible for inclusion in data analysis. Demographic characteristics including age, sex, and race were collected for these participants (see Appendix N for demographic characteristics of the sample). The majority (64.7%) of participants were aged 55-65. The sample was comprised of 76.5% females and 23.5% males. Sixteen participants were Caucasian and one participant was African-American.

Intervention Course

The major components of the intervention occurred at the patient's clinic appointment. This included asking the patient to participate, obtaining verbal agreement, collecting baseline data, and implementing the MI intervention. The student investigator performed these steps on a total of nine different days ranging from October 16, 2018 to November 30, 2018. This resulted in 25 participants that partook in the project intervention. Exactly four months after each patient's MI session, the student investigator collected follow-up data by reviewing their charts. Therefore, post-intervention data were collected on nine different days ranging from February 16, 2019 to March 30, 2019.

Certain patients were excluded from data analysis in order to maximize the validity of the project results. Two participants were excluded because of adjustments in their antihypertensive medication regimen. One participant was excluded due to a stroke that occurred during the four month follow-up time period. Five participants were excluded due to transferring their care to a different clinic. Therefore a total of 17 participants were included in data analysis.

Outcome Data

The purpose of this project was to determine if MI decreases 10-year stroke risk in patients 55 years and older in the primary care setting. Primary and secondary outcomes were measured before and after the MI intervention, and this data was analyzed to determine statistical significance. SPSS statistics software was utilized for this analysis.

Primary outcome. The primary outcome of the project was 10-year stroke risk as measured by the ACC ASCVD Risk Estimator Plus. Mean stroke risk scores were collected before the MI session and four months after the session, and the Wilcoxon signed rank test was used to statistically analyze this data (see Appendix O for the Wilcoxon test analysis table). The mean stroke risk decreased from 17.1 before the intervention to 14.0 after the intervention in this small sample. The difference was not statistically significant ($p = .136$), and the sample lacked the anticipated power.

Secondary outcomes. Secondary outcomes included BMI, total cholesterol, HDL, LDL, systolic BP, and smoking status. These were also analyzed using the Wilcoxon signed rank test. Mean values for BMI, HDL, LDL, and systolic BP were improved after the intervention, but the differences were not statistically significant. Mean systolic BP improved from 137.5 before the intervention to 129.1 after the intervention; this was the outcome that most closely approached statistical significance ($p = .064$). Total cholesterol levels actually increased from a mean of 180.1 to 180.3.

Smoking status was a nominal dichotomous variable, so this was analyzed using McNemar test (see Appendix P for the smoking status analysis table). Of the 17 participants, three were current smokers at the beginning of the intervention. All three of these participants remained smokers after the intervention so this outcome did not demonstrate statistical significance.

Missing data. During post-intervention chart reviews, it was recognized that some participants did not have updated BMI, BP, or lab values in the electronic medical record (EMR). This was an expected limitation of this project. In these situations, the student investigator used the most recently charted values, even if they were the same values that were collected pre-intervention. These values could still be utilized to calculate the participant's 10-year stroke risk.

Discussion

Successes

Some of the most important successes that were recognized in this pilot project include improvements in the mean values of the majority of the project outcomes. The difference in pre-intervention and post-intervention mean systolic BP approached statistical significance; this is important because hypertension is one of the five risk factors that account for 80% of global stroke risk (O'Donnell et al., 2010). Although analysis of the primary outcome of 10-year stroke risk did not demonstrate statistical significance in this small sample, mean stroke risk did decrease from 17.1 to 14.0, and this improvement is considered a success for this project. The single MI session that was led by the student investigator was found to be both time- and cost-efficient, which is important in the primary care setting.

Study Strengths

There were several elements related to the project setting that provided support for the intervention. The primary care clinic that was chosen for the project site serves many patients in the older adult population. This was considered a strength because patients were required to be 55 years or older to be included in the study. Another strength was that this clinic had the resources available to draw patient labs on-site. This resulted in increased patient compliance and quicker lab results which were important because total cholesterol, HDL, and LDL were secondary outcomes of this project. It was extremely beneficial that the student investigator had access to patient EMRs which allowed for timely and thorough chart reviews to collect both pre- and post-intervention data. The clinic staff, especially the nurse practitioner that served as one of the main project facilitators, provided support for the intervention in a variety of ways. The nurses at the clinic take the patient vital signs and draw their labs, both of which were necessary to collect data related to the project outcomes. In addition, all members of the clinic staff were verbally supportive and encouraging to the student investigator as well as the patients who participated in the project.

All components of the intervention were completed successfully. Patients were very receptive to the student investigator's approach and explanation of the project. The majority of patients that were eligible for the study did provide verbal agreement to participate. The participants expressed gratitude and enjoyment that the student investigator was taking additional time to discuss individualized lifestyle modification options with them. The student investigator was easily able to access and review patients' charts via the EMR to collect post-intervention data.

Results Compared to Literature

No studies in the literature review specifically examined the effect of MI on overall stroke risk, but there have been many studies regarding the effect of MI on physiologic and behavioral factors that contribute to stroke risk. The majority of studies regarding MI have demonstrated statistically significant outcomes related to lifestyle modifications (Lundahl et al., 2013; Martins & McNeil, 2009; Morton et al., 2015; Thompson et al., 2011). Regarding BP specifically, which was the project outcome that most closely approached statistical significance, some studies have revealed conflicting findings. A study by Ma et al. (2014) demonstrated that MI significantly improved BP. However, studies by Barker-Collo et al. (2015) and Lee et al. (2016) did not support these findings as BP was not significantly improved after MI interventions.

In the literature, MI has also had a significantly positive effect on smoking (Lee et al., 2016; Lundahl et al., 2013), body weight (Lundahl et al., 2013; Thompson et al., 2011), and lifestyle modifications such as diet and exercise habits (Martins & McNeil, 2009; Thompson et al., 2011). This differs from this project results as MI did not demonstrate statistical significance regarding the outcomes of smoking status or BMI. Regarding lipids, the study by Barker-Collo et al. (2015) revealed similar results to this project, that MI did not significantly improve these levels.

Overall, studies have consistently demonstrated that MI is a cost-effective intervention that can be successfully implemented regarding a variety of health behaviors and lifestyle modifications (Barker-Collo et al., 2015; Lundahl et al., 2013). While the outcomes of this project were not statistically significant, the successes of the project are consistent with the conclusions of this literature.

Limitations

Internal Validity Effects

This project contained several limitations related to internal validity. Threats to internal validity that were recognized during the planning stage of this project included aspects that would make it difficult to attribute causation to the intervention rather than an extraneous factor. For example, a participant's BP may have increased or decreased after the intervention, but it could have been due to varying levels of pain or stress at the time the BP was measured. BP fluctuations can also be related to the time of day the measurement was taken in relation to when the patient took an antihypertensive medication. Many other medications can also have effects on the outcomes that were measured in this project, such as antidepressant medications having common side effects of weight gain or loss. The student investigator did not take into account medication adjustments during the project time frame that were not directly related to antihypertensive medications.

As expected, the content of the MI sessions varied greatly among the participants. Because MI is an individualized behavioral intervention that promotes collaboration with the patient, the interaction with each participant was unique. For example, one participant may have wanted to focus on diet changes in order to lose weight while another participant wanted to discuss smoking cessation. This threatened internal validity and therefore potentially affected the results of the study.

External Validity Effects

This project also contained threats to external validity that could limit generalizability. Due to convenience sampling and resulting selection bias, the sample of participants from the project site is probably not representative of the general population. Caucasian and African American were the only two races represented in the project, with African American comprising only 5.9% of the sample. In addition, only 23.5% of participants were males. Therefore the sample demonstrated less diversity than the general population.

Another limitation was the small sample size. A priori power analysis indicated a desired sample size of 28 participants, and only 17 participants were able to be included in data analysis. A larger sample size would likely result in greater statistical power.

Sustainability and Plans to Maintain Effects

As the project intervention incorporated only a single MI session, this could negatively affect the sustainability of the positive outcomes. The evidence is conflicting regarding how many MI sessions are necessary to produce significant results (Martins & McNeil, 2009), but typically two or more sessions demonstrated greater effectiveness than a single session (Morton et al., 2015; Thompson et al., 2011). In addition, only the student investigator attended the educational course on leading MI sessions; no other staff members at the clinic have had this training.

Efforts to maintain the project improvements include the student investigator providing clinic staff members with a brief explanation of the techniques of MI so that they can incorporate these principles into patient visits. This is important because the general use of brief behavioral interventions have been shown to produce positive health outcomes (Johnson et al., 2010; Newsom et al., 2011). Additionally, patients were educated and reminded during their MI sessions that these health behaviors are long-term commitments and lifestyle changes and that it would be beneficial to their health to continue these changes after the project has ended.

Efforts to Minimize Limitations

Threats to internal validity were minimized by excluding patients from data analysis who underwent a change in their antihypertensive medication regimen within the project time frame. Attrition was also a threat that affected this project, but efforts were made to minimize this by obtaining post-intervention data from chart review rather than attempting to contact the participants. While the content of the MI sessions still varied among participants which affected internal validity, this threat was minimized as the student investigator was the only person delivering the MI intervention and collecting data.

Interpretation

Expected and Actual Outcomes

Expected results of this project included improvements in all primary and secondary outcomes after the MI intervention: 10-year stroke risk, BMI, total cholesterol, HDL, LDL, systolic BP, and smoking status. Actual results included improvements in all outcomes except for total cholesterol and smoking status. One of the possible reasons for these differences in expected and actual outcomes is the small sample size used for data analysis. Not only was the desired sample size of 28 participants not met due to time constraints, but then eight participants' data had to be excluded from analysis for various reasons. This had a negative effect on the statistical power of the study. Another factor that likely affected the results of the study was that many participants did not have updated lab results regarding lipid levels in their charts. Again, this was due to the time constraints of the project.

Intervention Effectiveness

The MI session did not demonstrate statistically significant improvements in the project outcomes. Therefore it cannot be inferred that a single MI session regarding modifiable stroke risk factors is effective in reducing 10-year stroke risk in the primary care setting. Despite lacking statistical significance, improvements were recognized in 10-year stroke risk, BMI, HDL, LDL, and systolic BP after the MI session. This indicates that MI has the potential to be effective in addressing these health outcomes.

The study intervention was appropriate for the primary care setting because providers in this setting are already responsible for health promotion and disease prevention efforts. The content of the MI sessions included topics such as nutrition, exercise, weight management, social support, and medication adherence, which are applicable to nearly every patient in the primary care setting. The literature has also supported the use of MI in other medical settings such as inpatient, emergency department, and specialty clinics (Lundahl et al., 2013).

Intervention Revision

There are intervention modifications that can be applied that may improve attainment of the project outcomes. A longer time frame for recruitment of participants would likely result in a larger sample size. In addition, a longer time period to allow for participants to implement their behavior changes after the MI session could result in better outcomes and less missing data. Regarding the variability of the MI session content, a more structured script and consistent discussion topics among the participants could enhance internal validity and therefore improve the quality of the results.

Expected and Actual Impact to Health System and Costs

The expected impact of this project was that it would improve health outcomes for a very low cost. The actual impact was consistent with these expectations as the MI session did improve health outcomes, and the project was very cost-effective. If a 15-minute MI session in the primary care setting effectively reduces a patient's risk factors for stroke, this has the potential for cost savings related to pharmaceuticals, hospital stays, and reduced productivity.

The estimated cost for the project was $84.69. The actual cost of the project was actually lower at $79.00. The only project expense was the MI training session that the student investigator attended. This MI training is designed to be a one-time course that effectively prepares the attendee to lead MI sessions after completion. No additional materials such as paper or ink ended up being needed as the MI sessions were strictly verbal interactions. The student investigator self-funded the project, so there are no current funding sources for the study. Due to the low cost of the study, there is vast potential for economic sustainability.

Conclusion

The practicality and usefulness of MI as an intervention is well documented in the current literature. It is brief, can be implemented in a variety of settings, and has demonstrated effectiveness. The literature suggests that the most effective method of addressing primary stroke prevention is through lifestyle modification (Chiuve et al., 2008; Tikk et al., 2014), and MI has demonstrated a positive effect on multiple behavioral outcomes that are considered risk factors for stroke (Lee et al., 2016; Lundahl et al., 2013; Martins & McNeil, 2009; Morton et al., 2015; Thompson et al., 2011).

There is a vast potential for further studies regarding MI. The current literature has been fairly ambiguous regarding specific aspects of MI interventions such as length of time of each session, total number of sessions, and specific content (Martins & McNeil, 2009; Morton et al., 2015). Therefore, further research on any of these aspects, as well as on any health-related behavior, is warranted.

Dissemination of the project findings will occur in May 2019 and will include a poster presentation to UMKC students and faculty as well as submission to the American Association of Nurse Practitioners' (AANP) Journal for Nurse Practitioners. Results will also be shared with the staff at the clinic that served as the project site.

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Appendix A

Definition of Terms

Autonomy - a patient's right to be fully informed and educated about a health care decision, and to make that decision without coercion from others.

Brief behavioral intervention - a general term that describes a method of counseling that promotes a specific health behavior change

Modifiable risk factor - conditions that are within an individual's control that increases their risk for disease, namely stroke.

Primary prevention - refers to preventing a disease before it occurs.

Secondary prevention - refers to reducing the impact of a disease after it has already occurred.

Appendix B

Logic Model

PICOTS: In patients 55 years and older, does engaging in motivational interviewing (MI) regarding modifiable stroke risk factors compared with not engaging in MI reduce the 10-year stroke risk within six months in the primary care setting?					
Inputs	**Intervention(s)**	**Outputs**	**Outcomes -- Impact**		
	Activities	*Participation*	*Short*	*Medium*	*Long*
Evidence topics 1. Stroke prevention 2. Motivational interviewing 3. Health behavior change **Major Facilitators or Contributors** 1. Intervention takes place at regular appointment 2. Supportive staff in office 3. Large number of patients 55 years and older seen in clinic **Major Barriers or Challenges** 1. Lack of demographic variety 2. Following up in clinic within 4 months (especially lab draw for lipids) 3. Extraneous factors may affect results rather than the intervention	**EBP intervention which is supported by the evidence in the Input column:** Motivational interviewing **Major steps of the intervention:** 1. Ask to participate 2. Obtain verbal agreement 3. Baseline data collection 4. Motivational interviewing intervention 5. Post-intervention data collection	**The participants:** patients age 55 and older recruited from primary care clinic **Site:** Primary care clinic in northwest Missouri **Time Frame:** October 2018 - April 2019 (includes IRB approval, recruitment, intervention, and data collection) **Consent or assent Needed:** Yes **Person collecting data:** Carli Kerner, DNP student **Others directly involved in consent or data collection:** 1. Nurse practitioner serving as patients' PCP 2. Nursing staff that will measure BP and obtain blood work	**(Completed during DNP Project)** **Outcomes to be measured:** Primary: 10 year stroke risk Secondary: SBP, BMI, total cholesterol, HDL, LDL, smoking status **Measurement tools:** 1. ACC ASCVD Risk Estimator 2. Sphygmomanometer 3. lab draws 4. Self-report and chart review for smoking status 5. Traditional height and weight measurements for BMI **Statistical analysis to be used:** 1. Wilcoxon signed rank test 2. Descriptive statistics 3. McNemar test	**(after student DNP)** **Outcomes to be measured:** Better lifestyle choices: diet, exercise, weight management, smoking cessation, medication adherence	**(after student DNP)** **Outcomes that are potentials:** Reduced disability and/or mortality from stroke or other cardiovascular disease

Appendix C

Review of Evidence Table

PICOTS: In patients 55 years and older, does engaging in motivational interviewing regarding modifiable stroke risk factors compared with not engaging in motivational interviewing reduce the 10-year stroke risk within 6 months in the primary care setting?

First author, Year, Title, Journal	Purpose	Research Design[1], Evidence Level[2] & Variables	Sample & Setting	Outcome measurement & Reliability	Results & Statistical Test Used	Limitations & Strengths related to EBP project
Sub-topic: Stroke prevention						
Niewada (2016). Lifestyle modification for stroke prevention: facts and fiction. *Current Opinion in Neurology.*	To summarize recent evidence regarding lifestyle modifications effect on stroke risk.	Non-experimental, level 7 expert opinion.	N/A	N/A	Results: level 1 evidence still lacking for interventions that address lifestyle modification, long-term lifestyle changes difficult to maintain, individualized approach needed.	Strengths: emphasizes individualized approach. Limitations: evidence level 7.
Siddeswari (2016). Comparative study of risk factors and lipid profile pattern in ischemic and haemorrhagic stroke. *Journal of Medical and Allied Sciences.*	To compare risk factors and lipid profiles to detect patterns in incidence of ischemic and hemorrhagic strokes.	Quantitative, non-experimental, level 6 (descriptive) retrospective cross-sectional study. IV: risk factors for stroke (lipids, htn, smoking, etc.). DV: incidence of ischemic or hemorrhagic stroke	Sample: 100 acute stroke patients, age 20-80. Setting: Osmania General Hospital in Telangana, India.	Outcome measurement: number of ischemic and hemorrhagic strokes. Reliability: not reported.	Statistical test: Fischer exact test, p-values. Results: low HDL, htn, and smoking were statistically significant modifiable risk factors for both ischemic and hemorrhagic stroke.	Strengths: includes both types of stroke, focus on modifiable risk factors. Limitations: small sample size, includes ages 20-80, includes pts with hx of stroke, not U.S. based.
Brown (2015). A multicomponent behavioral intervention to	A church-based, theory-based intervention to reduce stroke risk	Quantitative, experimental, level 2 RCT. IV: Multicomponent	Sample: 801 subjects consented, 86% completed at	Outcome measurement: self-reported dietary intake and physical	Statistical test: repeated measures models for longitudinal data,	Strengths: large sample size, intervention included MI.

reduce stroke risk factor behaviors: The stroke health and risk education cluster-randomized controlled trial. *Stroke.*	factors in Hispanics and European Americans.	behavioral intervention group or control group (no intervention). DV: risk factors for stroke (sodium intake, BP, etc.).	least one outcome assessment. Setting: 10 Catholic churches in the Corpus Christi area.	activity, systolic BP, weight, waist circumference, glucose, HbA1C, lipid panel. Reliability: not reported.	intention-to-treat analysis. Results: intervention group had greater fruit/veg intake, less Na intake than control group, no treatment effect for BP, physical activity, weight, waist circumference, glucose, HbA1C, lipids.	Limitations: self-report not reliable, participation in intervention was lower than expected.
Larsson (2015). Primary prevention of stroke by a healthy lifestyle in a high-risk group. *Neurology.*	To explore the impact of healthy lifestyle on stroke risk in men at high risk of stroke due to existing cardiovascular disease.	Quantitative, non-experimental, level 4 prospective cohort study. IV: number (0-5) of healthy lifestyle habits (regarding diet, smoking, physical activity, BMI, and alcohol intake). DV: risk of stroke.	Sample: 11,450 males from Cohort of Swedish Men with hx of htn, high cholesterol, DM, HF, or A. fib. Setting: central Sweden.	Outcome measurement: stroke diagnoses obtained from national registries (validation study found these registries to be 92% accurate).	Statistical test: Cox proportional hazards regression models. Results: men who reported healthy habits in all 5 areas had a statistically significant 72% lower risk of stroke compared with men who reported healthy habits in 0-1 areas.	Strengths: large sample, excluded those with previous stroke (represents primary prevention), similar age group to my project. Limitations: reliance on self-report, only included males.
Meschia (2014). Guidelines for the primary prevention of stroke: A statement for healthcare professionals from the AHA/ASA. *Stroke.*	To provide up-to-date recommendations on the prevention of stroke in those who have not had a previous stroke or TIA.	Non-experimental, level 1 evidence-based practice guideline.	Setting: U.S.	N/A	Results: assess risk using a tool, exercise 40 min/day 3-4 days/wk, statins, Mediterranean diet, BP control, healthy weight, smoking cessation (help from meds if needed), alcohol cessation/ reduction, anticoagulants for A. fib and other cardiac conditions.	Strengths: focus on primary prevention, many modifiable risk factors addressed. Limitations: many recommendations focus on pharmacologic intervention.

Tikk (2014). Primary preventive potential for stroke by avoidance of major lifestyle risk factors: The European prospective investigation into cancer and nutrition-Heidelberg cohort. *Stroke.*	To determine the potential for primary prevention of stroke based on specific lifestyle modifications for middle aged adults.	Quantitative, non-experimental, level 4 prospective cohort study. IV: lifestyle risk factors for stroke. DV: risk of primary stroke.	Sample: 25,540 total, aged 35-64, recruited between 1994 and 1998. Setting: Heidelberg, Germany	Outcome measurement: self-report questionnaires at 3-year intervals, medical record reviews, population registry reviews, Reliability: not reported	Statistical test: Cox proportional hazards model, competing risk framework. Results: smoking and excess body weight are the strongest lifestyle risk factors, 38% of all strokes could have been prevented through lifestyle modification.	Strengths: focus on primary prevention, large sample size. Limitations: not in U.S., self-report often not reliable, may not have included ALL modifiable risk factors (ex. stress, OTC medications)
O'Donnell (2010). Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): A case-control study. *Lancet.*	To establish the association between risk factors and different types of stroke.	Quantitative, experimental, level 4 case control study. IV: stroke risk factors (hypertension, smoking, etc.). DV: incidence of ischemic and hemorrhagic stroke, or no stroke (control group).	Sample: 3000 patients admitted to hospital with first stroke, 3000 controls with no history of stroke. Setting: 22 countries (U.S. not included).	Outcome measurements: hospital record review. Measurements of IV: self-report, BP, HR, waist/hip measurements, questionnaires. Reliability: not reported.	Statistical test: descriptive statistics, multivariate logistic regression model. Results: 5 risk factors account for 80% of global stroke risk (hypertension, smoking, abdominal obesity, diet, physical activity).	Strengths: large sample, includes all types of strokes, includes modifiable risk factors. Limitations: no U.S. participants, self-report, use of proxy data when participants could not speak.
Chiuve (2008). Primary prevention of stroke by healthy lifestyle. *Stroke.*	To investigate the impact of multiple lifestyle factors on the risk of stroke.	Quantitative, experimental, level 4 prospective cohort study. IV: various risk factors for stroke (smoking, body weight, etc.). DV: incidence of stroke.	Sample: 43,685 men and 71,243 women from 2 previous studies without CV disease or cancer. Setting: U.S.	Outcome measurements: medical record review. IV measurement: self-report questionnaires (high reproducibility and validity).	Statistical test: descriptive statistics, Cox proportional hazards models, calculated population attributable risk percent, pooled logistic regression models. Results: low risk lifestyle could have prevented 47% stroke in women and 35% stroke in men.	Strengths: Focus on modifiable lifestyle factors, large sample size. Limitations: over 96% of participants were white, reliance on self-report.

Sullivan (2008). Predictors of intention to reduce stroke risk among people at risk of stroke: An application of an extended Health Belief Model. *Rehabilitation Psychology.*	To examine predictors of intention to reduce stroke risk in at risk individuals by applying an expanded Health Belief Model.	Quantitative, non-experimental, level 6 descriptive study. IV: predictors (stroke knowledge, demographics, beliefs about stroke, subjective norm, self-efficacy). DV: intention to exercise to reduce stroke risk.	Sample: 76 participants, age 56-90, 1 or more modifiable risk factor and no history of stroke. Setting: surveys distributed in bowling clubs, retirement villages, and senior citizens clubs.	Outcome measurement: participant report of intention to exercise. IV measurements: Cerebrovascular Accident Attitude and Beliefs Scale-Revised (CABS-R), Stroke Knowledge Test (SKT), Cronbach's α > .67 (moderate reliability).	Statistical tests: descriptive statistics, multiple regression analyses. Results: perceived benefits and self-efficacy were the top most important determinants of intention to exercise.	Strengths: focus on modifiable risk factor (exercise), theoretical framework used, involves beliefs/attitudes (incorporated in my MI intervention). Limitations: small sample size, focus on exercise only.
Sub-topic: Motivational interviewing						
Lee (2016). Effectiveness of motivational interviewing on lifestyle modification and health outcomes of clients at risk or diagnosed with cardiovascular diseases: A systematic review. *International Journal of Nursing Studies.*	To identify the best available evidence on the effectiveness of motivational interviewing on various outcomes for clients at risk for or with established cardiovascular disease.	Quantitative, non-experimental, level 2 systematic review of RCTs and quasi-RCTs with partial meta-analysis. IV: motivational interviewing or usual care. DV: various physiological and psychological outcomes.	Sample: 9 RCT studies from 2004-2011. 4,684 total participants. Setting: various countries.	Outcome measurement: self-report (multiple validated questionnaires), BP, BMI, lab values. Reliability: not reported.	Statistical test: Varied by study. Meta-analysis completed for studies with comparable outcomes only, therefore systematic review presented in narrative form. Results: MI had significant effect on smoking and depression only.	Strengths: focus on cardiovascular disease, small number of studies included. Limitations: included English and Chinese articles only, included patients with already confirmed cardiovascular disease, reliance on self-report.
Barker-Collo (2015). Improving adherence to secondary stroke prevention strategies through motivational interviewing:	To evaluate the effectiveness of motivational interviewing in preventing stroke recurrence.	Quantitative, experimental, level 2 RCT. IV: motivational interviewing or usual care. DV: BP, lipids, new cardiac events, quality of	Sample: 386 pts recruited from inpatient wards witin 28 days post stroke. Setting: MI sessions/interviews in hospital,	Outcome measurement: BP, lipid levels, Short Form-36 (quality of life; validated in New Zealand), Hospital Anxiety and Depression Scale (high	Statistical test: 2-tailed with 5% level of significance, linear regression models, random effects mixed models, model adjusted mean differences, odds	Strengths: large sample, low attrition, reliability of self-report enhanced by checking med dispense records. Limitations:

Randomized controlled trial. *Stroke.*		life, mood, med adherence.	pt's residence, and/or audio-recorded per pt preference.	sensitivity and specificity), self-reported med adherence. Reliability: not reported.	ratios. Results: significant diff in groups regarding med adherence, all other outcomes P > .05.	focused on secondary prevention rather than primary (as in my project).
Morton (2015). The effectiveness of motivational interviewing for health 43ehavior change in primary care settings: A systematic review. *Health Psychology Review.*	To examine the evidence for MI in primary care settings to achieve behavior change regarding physical activity, diet, and alcohol use.	Quantitative, level 2 systematic review without meta-analysis, 33 studies (RCTs and non-RCTs). IV: MI intervention group (alone or combined w/ other methods) and control group. DV: physical activity, diet, alcohol intake.	Sample sizes range from 50 to over 1000, mean age 40-60, primarily Caucasian. Setting: primary care, including both face-to-face and telephone delivery.	Outcome measurement: self-report (majority), accelerometer count, blood alcohol concentration. 11 out of 33 studies used objective measurements. Reliability: not reported.	Statistical test: varied by study. Physical activity results: 11 of 22 studies showed positive effect of MI. Diet results: 3 of 9 studies showed positive effect of MI. Alcohol use results: 6 of 11 studies showed positive effect of MI.	Strengths: primary care setting, emphasis on lifestyle/ behavior modification. Limitations: small sample sizes, inconsistency of MI intervention, reliance on self-report.
Ma (2014). Evaluation of the effect of motivational interviewing counselling on hypertension care. *Patient Education and Counseling.*	To determine the effectiveness of MI vs. usual care on Chinese hypertensive pts.	Quantitative, level 2 RCT. IV: MI or usual care group. DV: treatment adherence, BP, quality of life, self-efficacy, lab results.	Sample: 120 Chinese patients, mean age 58. Setting: 1 community-based practice and 1 hospital-based practice in the Haizhu district.	Outcome measurements: self-reported symptoms, BP, lipids, glucose, Treatment Adherence Questionnaire of Patients with Hypertension (Cronbach's α 0.86 and 0.82), General Self-Efficacy Scale (Cronbach's α 0.76-0.90), Medical outcomes study 36-item (Cronbach's α 0.68-0.96).	Statistical test: descriptive statistics, intention-to-treat analysis, independent samples t-test, paired samples t-test. Results: MI had a positive effect on BP, quality of life, medication adherence. MI had no significant effect on lab values.	Strengths: hypertension relevant to stroke prevention, uses similar outcomes as my project (BP, lipids). Limitations: not U.S. based, small sample size, reliance on self-report for some outcomes.
Lundahl (2013). Motivational interviewing in medical care settings: A	To evaluate to effectiveness of MI in various medical care settings.	Quantitative, level 1 systematic review of RCTs with meta-analysis. IV: MI group and control	Sample: 48 studies, total of 9618 participants. Setting: various	Outcome measurements: biophysical indicators (low effect sizes), records (moderate	Statistical test: omnibus effect size (OR). Results: overall statistically significant (positive) results for	Strengths: focus on risk reduction behaviors, large sample size. Limitations:

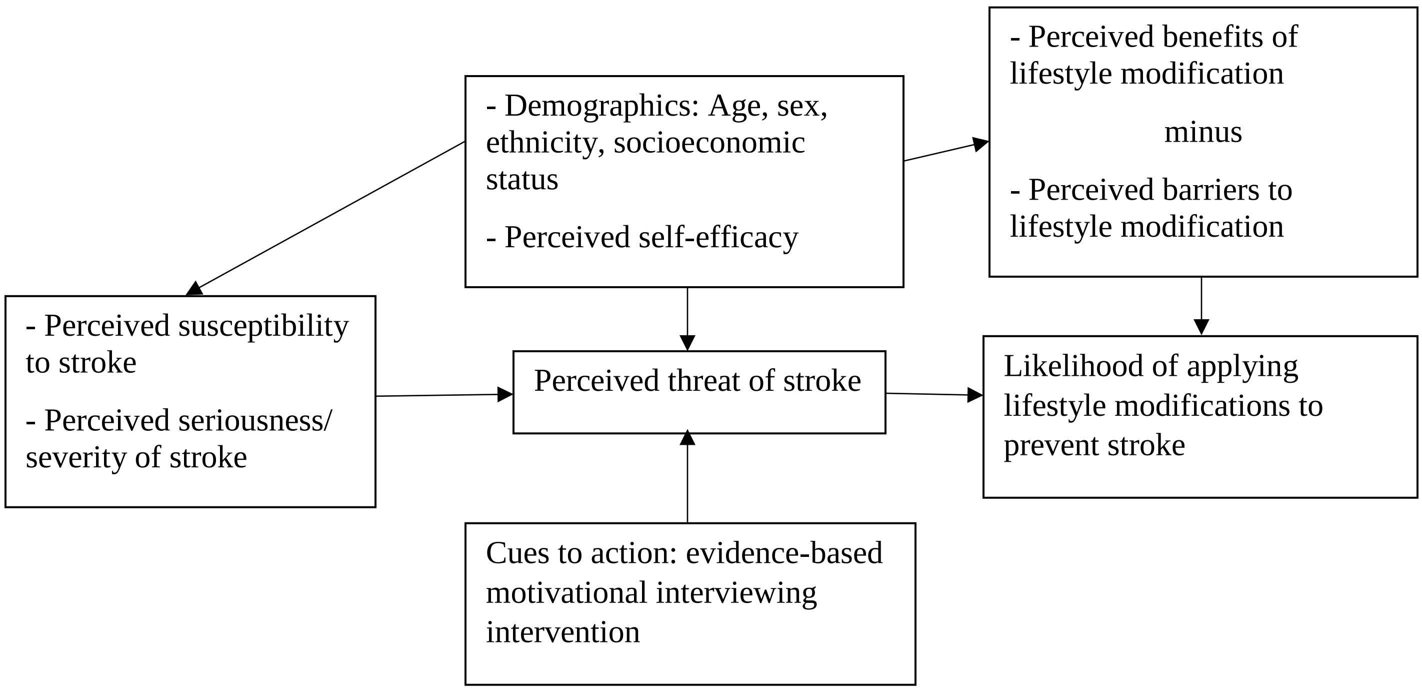
systematic review and meta-analysis of randomized controlled trials. *Patient Education and Counseling.*		group (waitlist, information only, or usual care). DV: various (risk reduction behaviors, treatment adherence, substance abuse, quality of life, etc.).	(hospital, primary care, ED, dental, specialty clinic, etc.).	effect sizes), and self-report (high effect sizes). Reliability: not reported.	MI. Significance among individual studies included BP, cholesterol, alcohol, tobacco, marijuana, weight. Many studies regarding risk reduction behaviors showed no significant effect of MI.	involved multiple settings other than primary care, MI intervention not consistent.
Thompson (2011). Motivational interviewing: A useful approach to improving cardiovascular health? *Journal of Clinical Nursing.*	To review the research findings related to motivational interviewing and its relationship to cardiovascular health.	Non-experimental, level 3 systematic review (including all research designs) without meta-analysis. IV: motivational interviewing or usual care. DV: various modifiable cardiovascular risk factors.	Sample: 13 studies (meta-analyses, systematic reviews, literature reviews, primary studies). Criteria included adults with 1 or more cardiovascular risk factor. Setting: varied by study.	Outcome measurements: varied by study (self-report questionnaires, assessment tools, audits of medical records). Reliability: not reported.	Statistical test: varied by study. Systematic review presented in narrative form. Results: primary studies had mixed results, systematic reviews and meta-analyses had significantly positive results regarding MI. Evidence indicates that MI is a useful approach to behavior change.	Strengths: included adults only, focus on cardiovascular health and modifiable risk factors. Limitations: small sample sizes, lack of consistency across motivational interviewing interventions.
Martins (2009). Review of motivational interviewing in promoting health behaviors. *Clinical Psychology Review.*	To review the research regarding the effectiveness of motivational interviewing on diet and exercise, diabetes, and oral health.	Quantitative, non-experimental, level 1 systematic review without meta-analysis. IV: MI and control group (no treatment, traditional advice, usual care, etc.). DV: various outcomes related to diet, exercise, DM, oral health.	Sample: 37 articles included, various participant demographics. Setting: various.	Outcome measurements: varied by study. Reliability: not reported	Statistical test: varied by study. SR in narrative format. Diet and exercise results: use of MI strongly supported. Diabetes results: MI effective alone or in combination with other interventions. Oral health results: MI effective in improving oral health status.	Strengths: Limitations: longer follow-up data needed, frequency and delivery of motivational interviewing intervention not consistent.

Sub-topic: Health behavior change						
Jackson (2015). The influence of partner's behavior on health behavior change: The English Longitudinal Study of Ageing. *JAMA Internal Medicine.*	To explore the influence of a partner's behavior on health behavior change.	Quantitative, non-experimental, level 4 prospective cohort study. IV: partner's health behavior (consistently healthy, consistently unhealthy, became healthy, became unhealthy). DV: subject's likelihood of making positive behavior change regarding smoking, exercise, weight.	Sample: 3772 couples (married or cohabitating) from ELSA study, at least one partner ≥ 50 y.o.). Setting: United Kingdom.	Outcome measurements: self-report of smoking and physical activity, height and weight to measure BMI. Reliability: not reported.	Statistical test: odds ratios, pairwise concordance rates and tetrachoric correlations for each behavior. Results: for every behavior, both men and women significantly more likely to make positive changes if their partner also made these changes.	Strengths: focus on older adults, modifiable risk factors similar to my project (smoking, weight), can incorporate partner support in MI, large sample. Limitations: not U.S. based, reliance on self-report, long-term changes rather than short-term.
Newsom (2011). Health behavior change following chronic illness in middle and later life. *The Journals of Gerontology.*	To examine lifestyle improvements among patients diagnosed with chronic diseases.	Quantitative, non-experimental, level 4 prospective longitudinal study. IV: presence or absence of new chronic illness diagnosis (heart disease, DM, cancer, stroke, lung disease, arthritis, htn). DV: behavior change regarding smoking, alcohol, exercise.	Sample: 11,191 participants aged 50-85. Setting: U.S., used interviewing.	Outcome measurements: self-report of chronic illness, smoking, alcohol use, exercise. Reliability: not reported.	Statistical test: Rao-Scott chi square, paired t-tests, logistic regression models. Results: majority of newly diagnosed individualized did not make positive health behavior changes. Smoking cessation after heart disease diagnosis was most common with 40% of smokers quitting.	Strengths: large sample size, age group aligns with my project, focus on modifiable behavior change. Limitations: long-term changes rather than short-term, reliance on self-report for all measures, more secondary prevention rather than primary.
Johnson (2010). Meta-synthesis of health behavior change meta-	To determine how well various behavioral interventions	Quantitative, level 1 meta-synthesis of meta-analyses. IV: interventions	Sample: 62 meta-analyses were included for a total 1,011	Outcome measurements: various self-reported and objective	Statistical test: fixed-effects models to determine mean effect sizes. Results:	Strengths: large sample, focus on public health only. Limitations:

analyses. *American Journal of Public Health.*	have achieved positive changes in health behaviors.	targeting behavior change. DV: behavior change (stress mgmt, health service participation, diet, exercise, addictions, screening and treatment in women, sexual behaviors).	studies and 599,559 participants. Setting: U.S., public health.	measurements. Reliability: not reported.	intervention group participants significantly adopted healthier behaviors, stress management demonstrated the most positive effect.	focus on both secondary and primary prevention, includes older studies, many studies relied on self-report, included all age groups.
Epton (2008). Self-affirmation promotes health behavior change. *Health Psychology.*	To determine if a self-affirmation intervention can increase a health-promoting behavior.	Quantitative, experimental, level 2 RCT. IV: self-affirmation group or control group. DV: consumption of fruits and vegetables, self-efficacy, intentions.	Sample: 93 adult females. Setting: University of Sheffield, UK.	Outcome measurements: 7 day food diary (self-report), 4 questions on self-efficacy (Cronbach's α .78 and .70), 2 questions on intentions (Cronbach's α .93).	Statistical test: ANCOVA, ANOVA. Results: self-affirmation group consumed significantly more fruits and vegetables and had significantly higher self-efficacy than control group.	Strengths: intervention similar to MI, focus on changing health behavior. Limitations: reliance on self-report, only females, younger participants.

Appendix D

Health Belief Model Applied to Project



(Saunders, Frederick, Silverman, & Papesh, 2013). Schematic representation of the Health Belief Model [Figure]. Retrieved from https://www.researchgate.net/figure/236917292_fig1_Figure-1-Schematic-representation-of-the-health-belief-model

Appendix E

IRB Approval Letter

Office of Research Services

UMKC
5319 Rockhill Road
Kansas City, MO 64110
TEL: (816) 235-5927
FAX: (816) 235-5602

NOT HUMAN SUBJECTS RESEARCH DETERMINATION

Principal Investigator: Dr. Lyla Lindholm
UMKC Health Sciences Building
Kansas City, MO 64108

Protocol Number: 18-210
Protocol Title: The Effect of Motivational Interviewing on Stroke Risk in Adults
Type of Review: Not Human Subjects Determination

Date of Determination: 10/09/2018

Dear Dr. Lindholm,

The above referenced study, and your participation as a principal investigator, was reviewed and determined to be Not Human Subjects Research (NHSR). As such, your activity falls outside the parameters of IRB review. You may conduct your study, without additional obligation to the IRB, as described in your application.

The NHSR Determination is based upon the following Federally provided definitions:

"Research" is defined by these regulations as "a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge."

The regulations define a **"Human Subject"** as "a living individual about whom an investigator (whether professional or student) conducting research obtains: data through intervention or interaction with the individual, or identifiable private information."

All Human Subjects Research must be submitted to the IRB. If your study changes in such a way that it becomes Human Subjects Research, please contact the Research Compliance office immediately for the appropriate course of action.

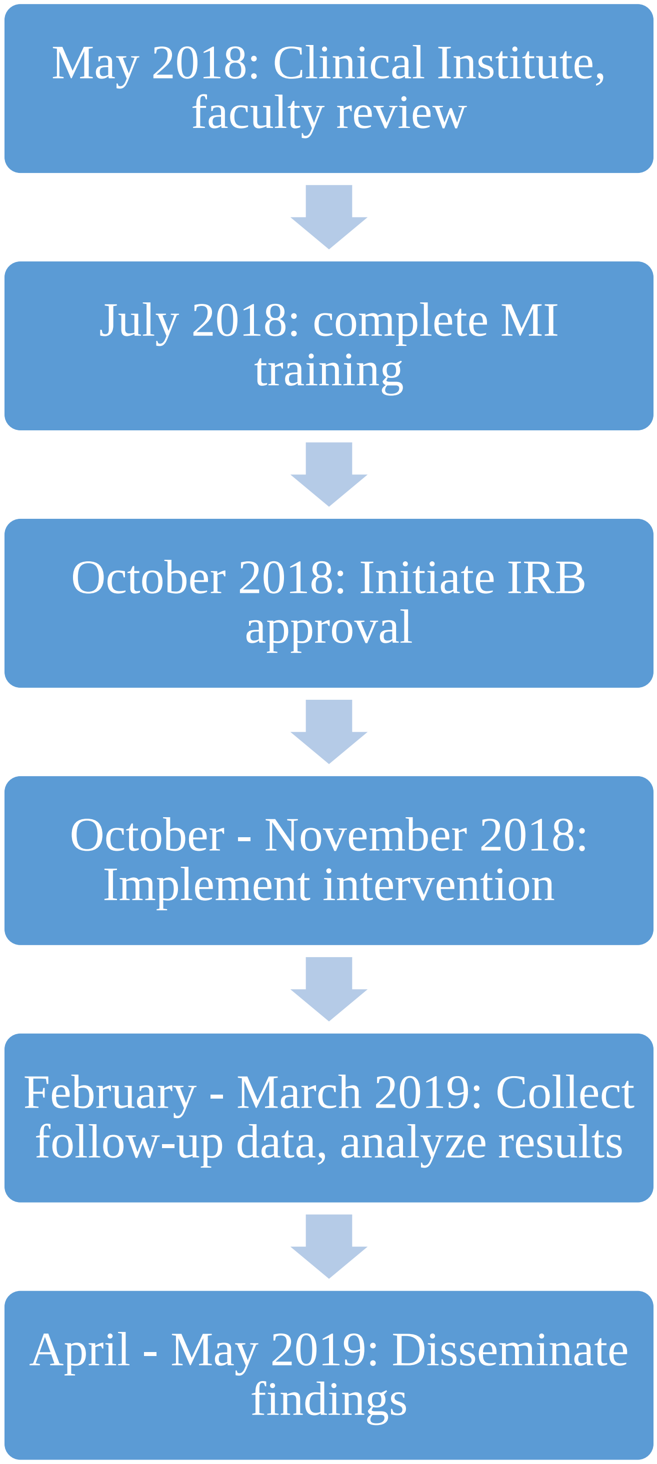
Please contact the Research Compliance Office (email: umkcirb@umkc.edu; phone: (816)235-5927) if you have questions or require further information.

Thank you,

Bailey Walton
UMKC IRB Administrative Office

Appendix F

Project Timeline



Appendix G

Cost Table

Item	**Item Description**	**Quantity**	**Unit Cost**	**Anticipated Cost**
Print materials: paper for writing or printing	MI is delivered verbally, but patient may request written or printed information.	1 ream	$5.69	$5.69
MI Training	Online course to train student in delivering MI session.	1	$79	$79
Student Time and Travel	165+ hours	N/A	Student will not be compensated for time and travel.	$0
Total				**$84.69**

Appendix H

Intervention Flow Diagram and Timeline

Step 1: Ask to Participate

- October - November 2018
- Student investigator will ask patients to participate who are 55 years of age or older who have an appointment at the clinic.

Step 2: Obtain agreement

- Student investigator will explain the improvement project to the patient.
- Student investigator will obtain verbal agreement from the patient to be involved in the improvement initiative.

Step 3: Baseline data collection

- Student investigator will review charts of the patients and collect baseline data: demographics, smoking status, BMI, blood lipid levels, blood pressure
- Student investigator will use the collected data to assess 10-year stroke risk as derived from the ACC ASCVD Risk Estimator

Step 4: Intervention

- Student investigator will lead a 10-15 minute motivational interviewing session at the patient's appointment in the clinic
- Session will focus on reducing risk factors for stroke through lifestyle modifications

Step 5: Post-intervention data collection

- February - March 2019
- Student investigator will review charts to collect data: BMI, blood lipid levels, blood pressure, smoking status
- Student investigator will use the data to assess 10-year stroke risk derived from the ACC ASCVD Risk Estimator.
- The provider will share the improvement information with the patient at the next clinic appointment.

Appendix I

Sample Intervention Materials

The following text was copied from the MI training materials provided by the Psychotherapy.net Academy (2016).

The MI counselor should focus first on establishing a relationship characterized by acceptance, respect, and partnership with the client, remembering the importance of honoring the client’s autonomy. Counselors should pay particular attention to the “righting reflex” in themselves—the tendency to want to give advice or lecture the client, and, as much as possible, to offer a reflection instead of following that impulse. Remember that the counselor’s role is not to try to influence the client in a particular direction, but to guide them through an exploration of all the important aspects of the issue. Focus the session by utilizing the ruler exercise to assess where the client is in terms of importance, confidence, and commitment (e.g. by asking, “On a scale of zero to ten, where zero is not at all important/confident/committed and ten is totally important/confident/committed, where would you put yourself?”). Use the information that you get from the ruler exercise to help pinpoint where the client is stuck and to help set the focus for the session.

Then, practice evoking the client’s ambivalence, making room for all sides of their dilemma. When the client gives reasons for not wanting to change (sustain talk), invite them to explore their barriers to change, including low importance, low confidence, or low commitment (depending on what you uncover from the ruler exercise). The focus here is on making space for the client to explore their sustain talk, as opposed to trying to convince them to change. Use open questions to learn more from the client about why they don’t want to change and use reflections to mirror back what you’re hearing. Keep an ear out for any change talk that arises, and be sure to reinforce this through reflections and open questions such as, “If you were going to do this what might this look like? Where might you start? What might you need?” Use affirmations to support any efforts you hear the client is making and any strengths that the client has revealed.

Throughout the session, pay particular attention to practicing the key MI technique of reflections to let the client know that you’re understanding what they’re saying and also to try to deepen what they’re sharing, picking up on any feelings and meaning that might be there for them (complex reflections), and reflecting both sides of their ambivalence (double-sided reflections). Offer a periodic summary to pull all of what you’ve heard together.

Psychotherapy.net Academy. (2016). *Role-Plays.* Retrieved from https://academy.psychotherapy.net/products/motivational-interviewing-step-by-step/categories/114613/posts/416576

Appendix J

Sample Recruitment Script

Student investigator: “Excuse me, sir/ma’am. Do you have a minute? My name is Carli and I am a DNP student at UMKC. I am working on a research study, and I am approaching you to see if you’d like to be in the study. This study is not part of your treatment here at the clinic. There is nothing in particular about you, personally, that made me ask you to participate. I am approaching every patient at this clinic who is aged 55 years or older. Whether or not you decide to participate will not affect your care at this clinic. Are you interested in hearing some details about the research study?”

Appendix K

Data Collection Template

	Age	Sex	Race	PreStrokeRisk	PostStrokeRisk	PreBMI	PostBMI	PreCholesterol	PostCholesterol	PreHDL	PostHDL	PreLDL	PostLDL	PreSBP	PostSBP	PreSmoking	PostSmoking
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	

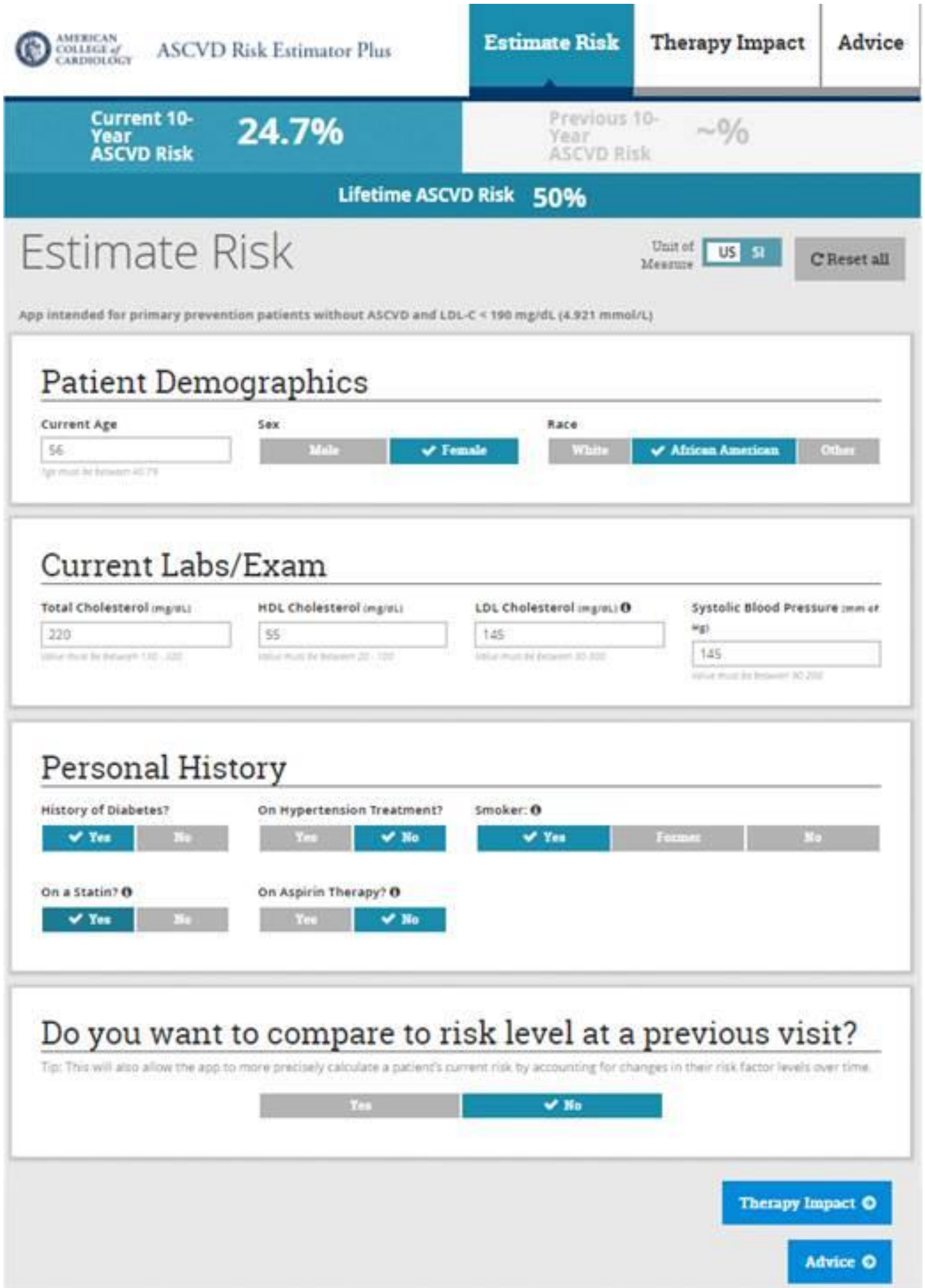
Data View | Variable View

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	Age	Numeric	8	2	Participant's age	None	None	6	Right	Scale	Input
2	Sex	Numeric	8	2	Participant's sex	{1.00, male}...	None	6	Right	Nominal	Input
3	Race	Numeric	8	2	Participant's race	{1.00, White...	None	6	Right	Nominal	Input
4	PreStrokeRi...	Numeric	8	2	10-year stroke r...	None	None	11	Right	Scale	Input
5	PostStroke...	Numeric	8	2	10-year stroke r...	None	None	11	Right	Scale	Input
6	PreBMI	Numeric	8	2	BMI pre-interve...	None	None	6	Right	Scale	Input
7	PostBMI	Numeric	8	2	BMI post-interv...	None	None	6	Right	Scale	Input
8	PreCholeste...	Numeric	8	2	Total cholester...	None	None	11	Right	Scale	Input
9	PostCholest...	Numeric	8	2	Total cholester...	None	None	11	Right	Scale	Input
10	PreHDL	Numeric	8	2	HDL pre-interve...	None	None	7	Right	Scale	Input
11	PostHDL	Numeric	8	2	HDL post-interv...	None	None	7	Right	Scale	Input
12	PreLDL	Numeric	8	2	LDL pre-interve...	None	None	7	Right	Scale	Input
13	PostLDL	Numeric	8	2	LDL post-interv...	None	None	7	Right	Scale	Input
14	PreSBP	Numeric	8	2	Systolic blood ...	None	None	7	Right	Scale	Input
15	PostSBP	Numeric	8	2	Systolic blood ...	None	None	7	Right	Scale	Input
16	PreSmoking	Numeric	8	2	Smoking status...	{1.00, curre...	None	9	Right	Nominal	Input
17	PostSmoking	Numeric	8	2	Smoking status...	{1.00, curre...	None	9	Right	Nominal	Input
18											
19											
20											
21											
22											
23											
24											

Data View | Variable View

Appendix L

Screenshot of ACC ASCVD Risk Estimator



(American College of Cardiology Foundation, 2018). App screenshots [Figure]. Retrieved from http://www.acc.org/tools-and-practice-support/mobile-resources/features/2013-prevention-guidelines-ascvd-risk-estimator

Appendix M

Statistical Analysis Table Templates

Table 1. Demographic characteristics.

Variables	*n*	%
Age		
55-65		
66-75		
76-85		
86+		
Sex		
Male		
Female		
Race		
Caucasian		
African American		
Hispanic		
Other		

Table 2. Wilcoxon signed rank test comparing pre-MI and post-MI data.

Variables	Pre-MI mean (SD)	Post-MI mean (SD)	Z	p-value
Stroke risk				
BMI				
Total cholesterol				

HDL
LDL
Systolic BP

Table 3. McNemar test comparing pre-MI and post-MI smoking status

	n	p-value
Smoking status		

Appendix N

Demographic Characteristics

Variables	*n*	%
Age		
55-65	11	64.7
66-75	5	29.4
76-85	1	5.9
Sex		
Male	4	23.5
Female	13	76.5
Race		
Caucasian	16	94.1
African American	1	5.9

Appendix O

Wilcoxon Signed Ranks Test comparing pre-MI and post-MI data

Variables	Pre-MI mean (SD)	Post-MI mean (SD)	Z	p-value
Stroke risk	17.1 (15.2)	14.0 (10.7)	-1.492	.136
BMI	36.7 (9.5)	36.4 (9.7)	-.712	.476
Total cholesterol	180.1 (38.8)	180.3 (39.4)	- .356	.722
HDL	47.3 (16.9)	50.1 (18.5)	- 1.640	.101
LDL	107.9 (25.0)	106.9 (26.8)	-.267	.790
Systolic BP	137.5 (19.4)	129.1 (10.5)	-1.852	.064

*statistically significant, $p \leq .05$

Appendix P

McNemar test comparing pre-MI and post-MI smoking status

	n	p-value
Smoking status	17	1.00

Appendix Q

Project Proposal Approval Letter

UMKC School of Nursing and Health Studies

October 2, 2018

UMKC IRB
UMKC DNP Student

UMKC IRB and DNP Student

This letter serves to provide documentation regarding Carli Kerner's Doctor of Nursing Practice (DNP) Project proposal. Ms. Kerner obtained approval for her project proposal, *The Effect of Motivational Interviewing on Stroke Risk in Adults*, from the School of Nursing and Health Studies DNP faculty on October 1, 2018.

If we can provide further information, please feel free to contact us.

Sincerely,

Dr Cheri Barber

Cheri Barber, DNP, RN, PPCNP-BC, FAANP
Clinical Assistant Professor
DNP Program Director
UMKC School of Nursing and Health Studies
barberch@umkc.edu

Lyla Lindholm, DNP, ACNS-BC
Clinical Assistant Professor
DNP Faculty