

Stroke Education to Reduce Adult Stroke Risk: An Evidence-Based Quality Initiative

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### Abstract

A stroke can have a devastating effect on a person's health and life expectancy. Implementation of beneficial and relevant prevention strategies, such as reducing weight, increasing physical activity, and smoking cessation, have the potential to reduce the burden of stroke. The purpose of the quasi-experimental, single group study was to determine if evidence-based stroke education reduces primary stroke risk within a five-month period. Ten adults, 18 years and older who scored in the *caution or high* category of the National Stroke Association's stroke risk scorecard were included in the study. Convenience sampling was conducted at a primary care clinic in Missouri. The intervention consisted of one-to-one participant education with evidence-based stroke education materials. Follow-up interviews and lifestyle data kept participants motivated to reduce stroke risk. The primary outcome expected was a reduction of stroke risk measured by the National Stroke Association's stroke risk scorecard. Secondary outcomes included a greater knowledge base of stroke, measured by the National Institute of Health's stroke knowledge survey, along with an increase in physical exercise, weight reduction, and smoking cessation. By using evidence-based stroke education, participants reduced their stroke risk by 30%. Secondary outcome results included 50% of participants partaking in exercise, 10% with smoking cessation, and 20% with a reduced body mass index. Stroke can cause grave physical and mental disability resulting in prolonged hospitalizations, long-term care, and economic losses. Through a review of evidence-based practice, reduced stroke risk can benefit society by reducing the health burden of stroke.

*Keywords:* primary stroke prevention, exercise, physical activity, smoking, body mass index, stroke risk, and stroke knowledge

### Stroke Education to Reduce Adult Stroke Risk: An Evidence-Based Quality Initiative

Approximately 795,000 Americans suffer a stroke annually, and nearly one in four people will suffer a second stroke within the next year (Center for Disease Control and Prevention [CDC], 2017). Primary prevention is important because more than 77% of strokes are first events (Goldstein et al., 2011). Reducing risk factors for stroke decreases the age-specific occurrence of stroke as much as 40% within a 20-year period (Goldstein et al., 2011). Within the United States, a person suffers a stroke every four seconds and someone dies of one every four minutes (Go et al., 2014). Bell et al. (2013) used the Glasgow Outcomes Scale to assess post-stroke disability and discovered adequate recovery in 32% of stroke victims, moderate disability in 36%, and severe disability in 31% of participants. Once a stroke occurs, 15 to 20% of patients die, 10% fully recover, and 70 to 75% experience widespread disability, ranging from motor, sensory, cognition, or language dysfunction (Jeon & Jeong, 2015).

There are differences in stroke incidence, prevalence, mortality, and burden among different racial and ethnic groups in the United States. The prevalence of stroke in non-Hispanic whites is 2.3%, 4% in non-Hispanic African Americans, 2.6% in Hispanics, and 6% in American Indians/Alaskan Natives (Cruz-Flores et al., 2011). Stroke burden, disability, and mortality is higher in African Americans than in whites, with twice the number of incident strokes (Cruz-Flores et al., 2011). Racial and ethnic minorities have excess stroke risk factors, stroke deaths, and greater years of life lost than non-Hispanic whites (Cruz-Flores et al., 2011). Compared to whites, minorities also have poor stroke awareness; Hispanics are four times as likely and African Americans two and a half times more likely to score poor on stroke knowledge scales (Cruz-Flores et al., 2011).

Implementation of beneficial and relevant prevention strategies, such as reducing weight, increasing physical activity, and smoking cessation, has the potential to reduce the strain of stroke by up to a quarter (Hankey, 2014). If people received the preventable actions needed, heart attack would be lowered by 60%, stroke by 30%, and life expectancy would increase by 1.3 years with a higher quality of life (Bousser, 2012). This project entailed a synthesis of evidence describing the importance of adhering to a healthy lifestyle while modifying risk factors to reduce stroke incidence. Evidence shows that stroke risk perception is moderately poor, corroborating the importance of education to improve stroke awareness and knowledge (Dearborn & McCullough, 2009; Gomes et al., 2016; Itzhaki, MeInikov, & Koton, 2016; Kilkenny et al., 2016; Stroebale et al., 2011). Evidence emphasis was directed towards stroke knowledge, smoking cessation, weight control, and an increase in physical activity.

### **Local Issue**

In Missouri, the age-adjusted prevalence of stroke in 2006 was 3.2%, 3.3% in 2008, and 3.6% in 2010, attesting a 12.5% increase of stroke prevalence from 2006 to 2010 (CDC, 2012). Between the years 2005 and 2015 in Missouri, there were 33,933 stroke deaths (Missouri Department of Health and Senior Services [MDHSS], 2018). Between the years 2010-2014, 99,023 people were hospitalized for stroke-like symptoms (MDHSS, 2018). In 2011, risk factors and prevalence rates for stroke were surveyed among adults 18 years and older and discovered 1,416,784 people were overweight, 947,438 people smoked tobacco, and 972,511 people were physically inactive (MDHSS, 2018). In 2015, 49,888 people aged 55-64 and 98,031 people older than 65 suffered a stroke (MDHSS, 2018). In 2014, total charges resulted in \$509,877,285 for ischemic stroke and \$178,930,248 for hemorrhagic stroke (MDHSS, 2018). Of those who

suffered an ischemic stroke from 2010-2014, 36,687 people were discharged home, 9,666 people went to a long-term care facility, 11,215 went to rehabilitation, and 2,457 died (MDHSS, 2018).

### **Diversity Considerations**

Several dynamics impact racial and ethnic healthcare disparities including socioeconomic status, public awareness, literacy, language barriers, religious or cultural views, immigration status, and access to transportation (Cruz-Flores et al., 2011). The proposed project will take place within a primary care clinic in Missouri. There are a total of 13,158 residents, 63% being male and 37% female, with a median age of 38 (“U.S. Zip Codes,” 2019). Within this area, 86% of the population are Caucasian, 11% African American, 0.6% American Indian, and 0.4% Asian (“U.S. Zip Codes,” 2019). For people older than 25 years of age, 64% obtained a high school diploma and 15% have either an associate’s or bachelor’s degree (“U.S. Zip Codes,” 2019). Knowing that roughly 79% of this population holds a high school or higher educational status, education that was provided was between a sixth and eighth-grade education level according to the Raygor readability calculator. From 2014 to 2016, 44.7 per 100,000 residents died of a stroke (CDC, 2019). In 2014, 35% of residents were considered obese, and 30% reported physical inactivity (CDC, 2019).

### **Problem & Purpose**

#### **Problem Statement**

Primary prevention of stroke is a pressing public health need as evidenced by stroke’s position as the primary cause of disability, the second leading cause of dementia and the fifth leading cause of death in the U.S. today; approximately 140,000 people die every year in the U.S. due to stroke (Bousser, 2012; CDC, 2017).

#### **Intended Improvement with Purpose**

The number of comorbidities is increasing due to the aging population and changes in lifestyle habits (Jeon & Jeong, 2015). The prevalence of stroke increases with age, from 4.7% in adults aged 50 years and older and 7.6% in those over the age of 60 years (Jeon & Jeong, 2015). Along with this, women have a greater risk of stroke than men, which may be attributed to the longer life expectancy of women; women account for roughly 60% of stroke deaths (Go et al., 2014). People who incorporate healthy behaviors have an 80% lower risk of primary stroke compared with those who do not participate in healthy behaviors (Goldstein et al., 2011). The purpose of the quasi-experimental, single group study was to determine if evidence-based stroke education reduces primary stroke risk in adults 18 years and older who score in the *caution or high* category of the National Stroke Association's (NSA) stroke risk scorecard within a five-month period at a primary care clinic in Missouri.

### **Facilitators & Barriers**

This evidence-based practice (EBP) project took place at a primary care clinic in Missouri. The project facilitator was a family nurse practitioner who agreed to precept this student investigator after explanation of the EBP project. Other facilitators include the student investigator's knowledge on stroke prevention, the NSA's stroke risk scorecard, and recommendations from national guidelines. The estimated cost of this project was \$227, and with the low cost of this DNP project, the economic component of the project can be viewed as a facilitator in the realm of assisting in stroke risk reduction. The main barriers to the project included the lack of patient participation in the intervention or follow-up, limited project timeframe, extra time needed during the office visit to screen patient's stroke risk and one-on-one education, and the patient's education level. These barriers give rise to a decline in sustainability during this proposed project.

## Review of Evidence

### Inquiry

In adults 18 and older who score in the *caution or high* category of the National Stroke Association's stroke risk scorecard, does primary stroke prevention education aimed at lifestyle modification and behavior change, as compared to before receiving education, decrease primary stroke risk over a 5-month period at an outpatient family care clinic?

### Search Strategies

In preparation for an evidence-based project targeted at decreasing stroke risk, a comprehensive literature search was performed, and a synthesis of that literature is presented here. A systematic search was undertaken using PubMed, the Cumulative Index to Nursing and Allied Health Literature (CINHAL), Ebsco Host, the National Center for Biotechnology Information (NCBI), Google Scholar, and the University of Missouri-Kansas City's (UMKC) health science library. Search terms included primary stroke prevention, exercise, physical activity, smoking, body mass index (BMI), stroke risk, and stroke knowledge (see Appendix A). From the search, 152 articles were obtained, and 20 studies were most relevant to the PICOT inquiry. Inclusion criteria included studies conducted from 2008 to 2017, patients who were stroke free at baseline with a first stroke incidence within the follow-up period, and those with completed questionnaires concerning stroke knowledge. Excluded were studies addressing secondary stroke prevention, those with incomplete data on health factors, and studies that included people younger than 18 years old.

To provide a synthesis of evidence, fifteen quantitative, four qualitative and one mixed methods studies were analyzed (see Appendix B for level of evidence by McInyk and Overholt, 2015). The quantitative studies included one guideline (level I), one randomized controlled trial

(level II), two systematic reviews of cohort studies (level III), nine prospective cohort studies (level IV), one case control (level IV), and one mixed method study (systematic review with meta-analysis of cohorts [level III] combined with a cohort study [level IV]). The qualitative studies included two cohorts (level IV), one systematic review of qualitative studies (level V), and one cross-sectional study (level IV). The mixed study was a prospective cohort (level IV) (see Appendix C for an evidence table).

### **Synthesis of Evidence**

Stroke is a preventable disease with control of modifiable risk factors (Bell et al., 2013; Chieve et al., 2008; Kulshreshtha et al., 2013; Larsson, Akesson, & Wolk, 2014; O'Donnell et al., 2010; Zhang et al., 2011). On account of the devastating and irreversible consequences of stroke burden, primary prevention is considered to be the most effective approach in controlling stroke complications (Zhang et al., 2011). The majority of the community is unaware of their stroke risk, hence the importance of education regarding primary stroke prevention (Dearborn & McCullough, 2009; Gomes et al., 2016; Itzhaki et al., 2016; Stroebele et al., 2011). Five themes were identified in the literature, including information on stroke knowledge, primary stroke prevention, and stroke risk reduction strategies of smoking cessation, physical activity, and weight reduction. Multiple studies overlapped in topics for the synthesis of evidence; three studies were used for stroke knowledge, six for primary stroke prevention, ten for the correlation between stroke and tobacco use, five for obesity, and seven for physical activity.

**Stroke knowledge.** Stroke knowledge is found to be substandard among the general population, especially those who are at highest risk of stroke (Dearborn & McCullough, 2009). Education regarding stroke prevention must center on stroke risk factors and healthy lifestyles (Itzhaki et al., 2016). Overall, women manifest better knowledge before and after stroke



educational programs but also enhance their awareness to a greater magnitude than men (Stroebele et al., 2011). Those with preexistent illnesses are more likely to know about stroke risk factors than those without former conditions (Stroebele et al., 2011).

Stroebele et al. (2011) conducted a systematic review and discovered that a range of 60-86% individuals could identify at least one risk factor of stroke, but the percentage is considerably low when asked to recall more than two risk factors. In Itzhaki et al. (2016) study, 41.8% of men and 25.5% of women named hypertension as a contributing factor of stroke, 36.7% of men and 18.4% of women named current smoking, and 62% of men and 55.1% of women recalled less than twice a week of physical activity as a factor. Along with this, in Dearborn and McCullough's (2009) study, 62.8% of women recognized smoking as a modifiable stroke risk factor, 56.7% acknowledged being overweight, and 47.4% identified lack of exercise as risk factors.

In the Itzhaki et al. (2016) study, regarding general knowledge about stroke and causes, 1% of women and 3.8% of men had never heard of stroke, 12.7% of men and 8.2% of women have heard of stroke but did not know the definition, and 5% of men and 6.1% of women recalled inaccurate causes of stroke. Kilkenny et al. (2016) study demonstrated the effectiveness of educational programs regarding stroke and risk factors and found that participants' abilities to acknowledge stroke risk factors had lessened after three months compared to immediately after the presentations, but still showed a greater amount of knowledge than before the presentations. Gomes et al. (2016) researched general stroke knowledge and awareness of prevention and found 43.9% of participants knew what a stroke was, while 35% knew more than three risk factors. Only 28.8% of interviewees knew a preventative measure, with 39.8% stating physical activity,

29% obesity, 28.4% controlling blood pressure, 23.7% quitting smoking, 21.4% controlling dyslipidemia, and 18.3% avoiding excess alcohol (Gomes et al., 2016).

**Primary stroke prevention.** Before delving into a synthesis regarding specific risk factor reduction, it is of importance to touch on general primary stroke prevention. A study referenced by Howard and McDonnell (2015) found that relative risk of stroke decreased with the lifestyle additions of physical activity, smoking and alcohol cessation, weight reduction and management, and a healthy diet. Those who complied with all five elements had a 62% lower risk of ischemic stroke and 54% lower risk of total stroke than with those who did not (Howard & McDonnell, 2015; Larsson et al., 2014). Chiuve et al. (2008) reference a study that claimed those who adhere to a healthy lifestyle, such as never smoking, having a BMI less than 22 kg/m<sup>2</sup>, exercising more than four times a week, and eating a healthy diet, have a 71% reduced risk of developing a stroke.

Jeon and Jeong's (2015) study found that participants who participated in a stroke prevention program reduced stroke risk factors, with an average BMI reduction from 26.22 kg/m<sup>2</sup> to 25.60 kg/m<sup>2</sup>, systolic blood pressure (SBP) lessened by 3 points, fasting blood sugar dropped an average of 29 mg/dl, total cholesterol reduced by 15 mg/dl, and triglycerides decreased 21 mg/dl (Jeon & Jeong, 2015). Kulshreshtha et al. (2013) determined that following ideal health factors is associated with a significantly reduced risk of stroke. Those with average health had a 28% decreased risk of developing stroke, while those with optimal health had a 47% decreased risk (Kulshreshtha et al., 2013). Furthermore, individuals with only one out of seven ideal lifestyle behaviors compared to those with zero had a 30% reduced risk of stroke, whereas those with six versus zero factors had a 66% reduced risk (Kulshreshtha et al., 2013).

**Stroke and cigarette smoke.** Despite a clear correlation between smoking and increased health risks, tobacco use has persisted throughout the last quarter of the century, with 20.8% of the population continuing to smoke (Shah & Cole, 2010). Tobacco use is a primary cause of death and disability, accounting for 6.3% of the worldwide burden of disease and 19% of stroke incidence (Peters, Huxley, & Woodward, 2013). In the United States, the annual number of stroke deaths attributable to smoking ranges from 17,800 to 21,400, or 12 to 14% of the population (Goldstein, et al., 2011). Between 2000 and 2004, some 97,681 women died of stroke related to cigarette smoking (Goldstein, et al., 2011).

Peters and colleagues (2013) found that current tobacco use was correlated with an 83% increased risk of stroke incidence in women and 67% increased risk in men. They also found that men and women have an equal chance of acquiring a smoking-related stroke (Peters et al., 2013). Zhang et al. (2013) and Kulshreshtha et al. (2013) both found that compared to those who do not smoke tobacco, those who did had a 40% increased risk of developing stroke. Along with this, Zhang et al. (2011) found that compared to those who never smoked tobacco, those who were currently using or had ever used in their lifetime had a 36% increased risk of total stroke, with 28% risk for ischemic and 57% risk for hemorrhagic stroke. They also found that those who currently used tobacco products were 1.8 times more likely to develop stroke compared to those who did not (Zhang et al., 2011).

O'Donnell et al. (2010) discovered current tobacco use versus never or former use was connected with twice the amount of stroke risk. There was a stronger association between ischemic stroke and tobacco use in contrast with hemorrhagic stroke, with an increased risk of 2.3 and 1.5, respectively (O'Donnell et al., 2010). Bell and colleagues (2013) found that pre-stroke smoking in older women more than doubled post-stroke mortality risk, and past smoking

increased the risk of stroke by 49%. Edjoc, Reid, Sharma, and Fang (2013) found that within 30 days of former tobacco use, there was a favorable impact on reducing stroke risk and mortality.

**Stroke and obesity.** Within the U.S. population, obesity is connected with an increased risk of mortality and comorbid diseases, such as heart disease, stroke, and renal disease. In the BMI range of 25 to 50 kg/m<sup>2</sup>, each 5 kg/m<sup>2</sup> rise in BMI is linked with a 40% higher stroke mortality risk (Goldstein, et al., 2011). Individuals with a BMI greater than 25 kg/m<sup>2</sup> had a 24% increased risk of developing stroke, while those with a BMI greater than 30 kg/m<sup>2</sup> had a one and a half times increased risk of developing an ischemic stroke (Zhang et al., 2011; Zhang et al., 2013). Kroll et al. (2016) determined that greater adiposity is connected with an increased risk of ischemic stroke but an 11% decreased risk of hemorrhagic stroke.

**Stroke and physical activity.** Active men and women have a 25 to 30% lower risk of stroke than less active people (Goldstein, et al., 2011). Bell et al. (2013) found that those with physical inactivity had a 1.4 increased risk of stroke versus those with more than 150 minutes per week of physical activity, with a 39% increased risk of post-stroke mortality. Zhang's et al. (2013) found that compared to those who averaged more than thirty minutes of moderate physical activity a day, those who did not have a 40% increased risk of developing stroke. Diep et al. (2010) found that compared with low physical activity, moderate physical activity in men showed a 12% reduction in stroke risk and a 19% reduction with high physical activity; high physical activity in women showed a 24% reduction of stroke risk. Compared with light physical activity, Zhang et al. (2011) determined that those who participate in moderate or high physical activity have a 23% and 19% reduction in ischemic and hemorrhagic stroke, respectively.

Sattelmair, Kurth, Buring, and Lee (2010) found that women who walked more than two hours per week had a 30% lower stroke risk compared to women who did not walk and those

whose walking pace was brisk (>4.8km/hour) had a 37% lower risk. McDonnell et al. (2013) found that men who exercised one to three times per week compared to those who exercised more than four days a week were 1.3 times more likely to develop stroke. Further analysis discovered that those who exercised zero to three times a week compared to those who exercised four days a week were at a 1.2 times increased risk of developing a stroke (McDonnell et al., 2013).

### **Theory**

The health belief model (HBM) has supplied a theoretical structure for health-related behaviors that can be identified through modifiable lifestyle behavior (Orgi et al., 2012). The model specifies that if people recognize a negative health outcome to be severe, view themselves to be susceptible to it, perceive the benefits to behaviors that reduce the likelihood of the outcome to be high, and perceive barriers to adopting behaviors to be low, then behavior change is likely (Carpenter, 2010). A person's view of perceived susceptibility and seriousness will trigger motivational actions, and the perceived benefits provide the path of action (Orgi, et al., 2012). However, it takes a cue to action for the desired behavior to occur (Orgi et al., 2012). This project's cue to action included stroke education and prevention strategies, thus allowing participants to view their risk factors susceptible to stroke and understand the benefits of lifestyle modification.

King, Vidourek, and Merianos (2014) study reviewed the relationship between three out of six constructs of the HBM (perceived benefits, barriers, and cues to action) and how they relate to physical activity. They discovered that out of the 480 participants, 56% engaged in vigorous physical activity, with an average of 2.34 days of the week (King, et al., 2014). The top two perceived benefits included improving health (85%) and maintaining a healthy weight

(78.3%) (King, et al., 2014). One of the perceived barriers was lack of motivation (59%). The number of perceived cues was greater when participants had encouragement from peers to partake in vigorous activity (King et al., 2014). Through application of this model in relation to stroke risk, patients gained motivational factors to abstain from risky stroke behavior (see Appendix D for a theory to application diagram).

## **Methods**

### **IRB & Site Approval**

The primary and only institutional review board (IRB) for this project is the University of Missouri-Kansas City IRB (see Appendix E for approval letter). This project was categorized as evidenced-based quality improvement (EBQI). The project involved systematically obtaining information about living individuals through intervention and interaction intended to contribute knowledge regarding primary stroke prevention. The project took place at a primary care clinic in Missouri. Formal permission was obtained from site administrators prior to project implementation.

### **Ethical Issues**

Providing culturally competent education reduced the amount of grief a participant may feel after discussion of their increased stroke risk. The privacy of participants and confidentiality of data was obtained by removal of patient names on printed documents. Phone numbers were kept on a separate sheet of paper and stored in a lock-box in a locked cabinet at the clinic, and shredded at the completion of the project. Individuals were treated autonomously and were encouraged to exercise their autonomy to the fullest degree. This student investigator has no conflicts of interest.

### **Funding**

The total amount of funds estimated was \$227, including folders, office paper, poster printing, and travel expenses for dissemination (see Appendix F); therefore, a grant was not sought.

### **Setting & Participants**

The project took place at a primary care clinic in Missouri. Convenience sampling was used to recruit 73 participants. Inclusion criteria included all adults over the age of 18 who have never suffered a stroke or transient ischemic attack (TIA) and scored in the *caution or high* category of the stroke risk scorecard. Exclusion criteria will include those under the age of 18 and individuals with a past medical history of a stroke. Of the 73 participants, 24 people did not qualify for the study, 11 people refused to take part, and six had a history of stroke or TIA. The chief reasons for refusal were upcoming surgeries, lack of time or busy work schedules, and no plans to start exercising or stop smoking. Of the 32 participants that qualified, ten of those participated in the full five-month project (see Appendix G for a Logic Model).

### **Intervention**

First, patient's stroke risk was measured by using the NSA's stroke risk scorecard (National Stroke Association, 2018a). The factors assessed on the scorecard included blood pressure, atrial fibrillation, smoking status, cholesterol, diabetes, exercise, weight, and family history of a stroke. Patients' charts were reviewed for blood pressure, weight, and most recent cholesterol levels; and atrial fibrillation, smoking status, diabetes, exercise, and family history was evaluated during patient interview. Additional baseline data collected included the number of cigarette use per day and the number of days per week the participant exercises at least thirty minutes. Demographic data included age, sex, race, education level, and insurance coverage and was collected through chart review and patient interview.

Those who scored positive in the *caution or high* category and agreed to partake in the project were educated regarding the scorecard results, underwent one-on-one education, and provided with a stroke education folder. Each folder contained patient information sheets obtained from the American Heart Association/American Stroke Association (AHA/ASA), NSA, and the CDC (see Appendix H). Those who currently smoked or were trying to quit, overweight, or partook in little to no exercise received additional material of corresponding information. Each participant was provided with a five-month calendar (see Appendix I) to record the number of cigarettes smoked per day, their weight, and if they have completed thirty minutes of physical exercise. Provider approval was obtained for those patients whose risk reduction included physical exercise.

Two phone calls were made to each participant to discuss lifestyle modifications, the progression of their calendar data, and to answer any questions the patient had. During the final phone call, patients were asked to provide their final weight measurements, number of cigarette use per day, and the average of days per week of physical activity. A final chart review was completed on those patients who had a clinic visit after recruitment for accurate blood pressure, weight, and cholesterol levels. During the last phone interview, the ten participant's final stroke risk score was assessed using the scorecard, and a 7-question stroke knowledge survey derived from the National Institute of Health (NIH) (n.d) was administered (see Appendix J for a project timeline flow graph and Appendix K for an intervention flow diagram).

### **Change Process, EBP Model**

For this EBP proposal, both the model of change and the Stetler model directed the inquiry. Kotter and Cohen's model of change proposes that organizational change occurs when people are shown truths that influence their seeing, feeling, and changing pattern when



successfully altering behavior (MeInyk & Fineout-Overholt, 2015). For a successful change in an organization to occur, Kotter and Cohen propose eight steps must occur: urgency, team selection, vision and strategy, communication the vision, empowerment, interim successes, ongoing persistence, and nourishment (MeInyk & Fineout-Overholt, 2015). This model was facilitated by enhancing healthcare provider education of stroke risk factors. The Stetler model focuses on critical thinking to assess and utilize research to promote safe and effective evidence-based practice (Schaffer, Sandau, & Diedrick, 2012). The model can be used as a guide for the implementation of research into practice (Schaffer et al., 2012). Pertaining to this student investigator's inquiry, a systematic review of evidence of stroke was evaluated before applying to at-risk patients in a primary care setting. To assure sustainability after the project, providers were encouraged to coach patients regarding their stroke risk and the stroke education material used in this project were placed in the waiting room for patients to read.

### **Study Design**

This study was a quasi-experimental, one single experimental group design with pre- and post-evaluation.

### **Validity**

The intervention of stroke education has the potential to have a positive effect on decreased stroke risk. Threats to internal validity exist and results may be confounded by extraneous variables, including participants dropping out of the project or not answering the phone, the failure to complete the calendar data, cognitive impairments that limit learning, inability to exercise due to unforeseen health troubles during the study period, substandard weather preventing outdoor exercise, errors in the medical record or transcription errors, inaccurate weight scales, and self-report of weight, cigarette dependence, and physical exercise.

Keeping consistent with the intervention and instrumentation will strengthen internal validity, along with abiding by EBP guidelines to educate patients regarding the importance of stroke awareness and risk reduction. Threats to external validity also exist. The participants included an array of age, strengthening external validity by reducing selection bias.

### **Outcomes Measured**

The primary outcome of this proposed project included a reduction of stroke risk as measured by pre- and post-intervention scorecard scores. Secondary outcomes included greater stroke knowledge and lifestyle modification to reduce stroke risk, including smoking cessation, weight reduction, and an increase in physical exercise. Stroke knowledge was measured by a post-intervention stroke knowledge test. Smoking cessation was measured via pre and post tobacco dependence, weight measured via pre and post weight, and physical activity measured by pre and post average of number of days with thirty minutes or more of physical activity.

### **Measurement Instruments**

The measurement instruments used in this project included the NSA's stroke risk scorecard (see Appendix L) and the NIH's stroke knowledge test (see Appendix M). The primary outcome of a reduction of stroke risk was assessed with the scorecard. This student investigator completed the scorecard with each patient in clinic and educated them regarding the results, which took less than five minutes. A secondary outcome was greater stroke knowledge and was assessed with a knowledge test. The test was administered during the final phone call at the completion of the project. Published studies regarding the use and reliability of the NSA's stroke risk scorecard could not be identified. However, the National Stroke Association and Dilip Pandey, MD, PhD, University of Illinois, Chicago created a stroke risk assessment tool (SRAT) that is similar to the stroke risk scorecard. The SRAT was created by combining populations of

the studies from Atherosclerosis RISK in Communities, Cardiovascular Health Study, and MultiEthnic Study of Atherosclerosis. Data from Atherosclerosis RISK in Communities and Cardiovascular Health Study was used to construct an algorithm to calculate stroke risk and data from the MultiEthnic Study of Atherosclerosis was used for algorithm validation.

The stroke knowledge test is recommended for use by the NIH/National Institute of Neurological Disorders and Stroke which is a leading authority on stroke related health topics, and as such is regarded as a valid and reliable instrument. Permission was not needed to use the scorecard nor the knowledge test, as these instruments are in the public domain. Secondary outcomes of increased physical activity, weight reduction, and smoking cessation were measured via patient report.

### **Quality of Data**

A power analysis was calculated to determine the sample size due to the use of convenience sampling and an initial goal of a minimum of 50 participants. Using Gpower, a priori power analysis indicated a sample size of 35 participants to achieve a power of 0.8, medium effect, and alpha .05. However, only ten participants were recruited; therefore, power was not reached, and statistical significance testing was invalid and lacked meaning. Pre- and post-intervention data were compared, and data collected from this project was compared to benchmark published information. This DNP project closely resembles the study conducted by Kulshreshtha et al. (2013) titled *Life's Simple 7 and Risk of Incident Stroke: Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study*. The AHA developed Life's Simple 7 (LS7) which contains components of blood pressure, cholesterol, glucose, BMI, smoking, physical activity, and diet (Kulshreshtha et al., 2013). The literature exemplifies the importance of stroke risk reduction through lifestyle modification of unhealthy habits. This DNP

project is a quasi-experimental, single group design with pre and post evaluation, which is also supported in the literature.

### **Analysis Plan**

The stroke risk scorecard uses ordinal level of data; therefore, based on the pre- and post-intervention scorecard score, a Wilcoxon signed-ranks test was to be used if an adequate sample size for power was obtained in the study. Descriptive statistics were used to measure the results of the stroke knowledge test and demographic data. The first secondary outcome includes an increase of physical activity measured by an answer of yes or no and was to be analyzed using chi-squared test. The second secondary outcome includes a reduction of the number of cigarettes use per day measured by pre and post smoking dependence and was to be analyzed with a paired t-test if a sample size for power was obtained in the study. The last outcome includes a reduction in weight, measured by pre and post weights and was to be analyzed using paired t-tests if adequate sample size was achieved in the study (see Appendix N for a data collection template and Appendix O for a statistical analysis table template).

## **Results**

### **Setting & Participants**

This study targeted adults, 18 years of age and older, who scored in the *caution or high* category of NSA's scorecard. Risk factors included hypertension, atrial fibrillation, tobacco use, hypercholesteremia, diabetes, obesity, lack of physical exercise, and family history of stroke. Between September 17<sup>th</sup> through October 17<sup>th</sup>, 2018, recruitment occurred over ten days at a primary care clinic in Missouri. Of the 73 participants screened, 32 patients were considered at risk for stroke while 24 people were screen as low risk and were excluded. Eleven of the participants refused to take part in the project. The chief reasons for refusal were upcoming

surgeries, lack of time or busy work schedules, and having no plans to start exercising or stop smoking. Six of 73 participants had a prior history of stroke or TIA. Of the 32 participants that qualified, ten people participated in the five-month project. Demographic data obtained included gender, race, age, education, and insurance (see Appendix P).

### **Intervention Course**

This student investigator screened 73 patients using NSA's stroke risk scorecard. Thirty-two patients scored positive in the *caution or high* category and agreed to partake in the project. Ten minutes were spent with each participant and they were provided with one-on-one education regarding stroke, risk factors, and healthy lifestyle modifications for prevention. Each participant was given a folder containing evidence-based stroke information sheets. Those who currently smoked or were trying to quit, overweight, or partook in little to no exercise received additional material of corresponding information. Each participant was provided with a five-month calendar to record weight, the number of cigarettes smoked per day, and physical exercise.

Of the 32 participants who underwent one-on-one education, ten people answered two phone calls from this student investigator. During each phone session, the participants were asked about the progression of their calendar data, coached on lifestyle modification, and asked to provide their most recent blood pressure, weight, current exercise plan, and if applicable, the number of cigarette use per day. During the last phone interview, the participant's final stroke risk score was assessed using the scorecard and a 7-question stroke knowledge survey was administered to evaluate stroke knowledge (see Appendix Q for a data collection table).

### **Outcome Data**

Ten participants were recruited; therefore, power was not reached, and the statistical significance testing was invalid and lacked meaning. To measure each outcome of the project,

descriptive analysis was used. The primary aim of this quality initiative was to reduce primary stroke risk and attain a greater stroke knowledge base in adults over the age of 18 (see Appendix R for results of the primary and secondary outcomes).

**Primary stroke prevention.** After the completion of the project, 30% of participants lowered their stroke risk while 70% remained in the *high-risk* category. One participant who scored in the *high-risk* category lowered their systolic blood pressure by 26 points and lost 30 pounds, lowering their stroke risk to low. Another participant initially scored in the *high-risk* category and dropped to low risk after lowering their systolic blood pressure by 62 points and walking two miles seven days a week. An additional participant started walking for thirty minutes three times per week which lowered their risk from the *caution* category to low risk.

**Secondary outcomes.** In the 30% of participants who smoked cigarettes, 10% quit with the help of Chantix by the completion of the project. This patient remained in the *high-risk* category due to a BMI of 38, not partaking in physical activity, and a personal history of diabetes and a family history of a mother suffering from a stroke. After completion of the project, 20% of the sample reduced their BMI; one had a drop in their BMI by six points after losing thirty pounds while another reduced their BMI by one point. Of the sample, 40% of participants had an increase in BMI by one point, 10% by two points, and 30% had no fluctuation in weight.

Baseline data showed 30% of participants partook in 15-30 minutes of physical activity 3-7 times per week. Of this 30%, only 10% maintained their work-out regimen throughout the duration of the project. After the completion of the project, 50% of participants who had not been exercising before the intervention were now walking at least 15-30 minutes for two to seven days per week. Thirty percent of participants who were not exercising before the intervention did not start an exercise program. A stroke knowledge test was administered during the last phone

interview with the sample. Results showed 40% of participants received 100% scores while 40% missed one question (score of 86%) and 20% missed two questions (score of 71%).

## **Discussion**

### **Successes**

The primary aim of this quality initiative was to reduce primary stroke risk and attain a greater stroke knowledge base in adults over the age of 18. Of the ten participants included in the study, 30% had a reduction in their overall stroke risk. Results of the stroke knowledge test showed 40% of participants receiving 100% scores, while 40% missed one question (score of 86%) and 20% missed two questions (score of 71%). Secondary outcomes included a reduction of cigarette use and BMI, with an increase in physical activity. Of the 30% of participants who smoked tobacco, 10% quit the use of cigarettes by the completion of the project. Two in ten participants reduced their total body mass index, while 30% remained at a stable weight. After the completion of the project, 50% of participants who had not been exercising before the intervention were now partaking in walking for exercise at least 15-30 minutes 2-7 days per week.

### **Study Strengths**

There were many components related to this project setting that provided support and context for the intervention. The clinic in which this project was conducted is a primary care clinic that serves many patients over the age of 18. This was considered a strength because patients 18 years and older who had a high stroke risk were recruited into the study. It was valuable that the student investigator was able to access patients' electronic medical records which allowed for timely and thorough chart reviews to collect accurate blood pressure and weight if the participant visited the clinic after recruitment.

The clinic staff provided support for the intervention. The nurses at the clinic obtained the patients' vital signs and weight and performed a chart review for the most recent cholesterol value, all necessary for the data collection related to this project's outcomes. Furthermore, all members of the clinic staff, especially the nurse practitioner that served as one of the main project facilitators, were verbally supportive and encouraging, as well as the patients who participated in the project. Patients were receptive to the method and explanation of the project and gave verbal agreement to participation, allowing for success when implementing the intervention. The participants communicated appreciation that the student investigator took additional time to discuss personalized lifestyle modification choices with them.

### **Results Compared to Evidence**

In a study by Dearborn and McCullough (2009), stroke knowledge was found to be substandard among the general population, especially those who are at highest risk of stroke. After administering a stroke knowledge test, the current study results showed 40% of participants received a 100% score while 60% missed one or two questions. This compares similarly to the results of Dearborn and McCullough's (2009) study in that stroke knowledge is found to be poor. Of the 60% who missed questions, 40% remained in the *high-risk* category after the completion of the project. Gomes et al. (2016) researched general stroke knowledge and awareness of prevention and found 43.9% of participants knew the general definition of stroke. Comparably, in the current study, 40% of participants thought stroke could occur in the brain or heart.

A study referenced by Howard and McDonnell (2015) found that the relative risk of stroke decreased with the lifestyle additions of physical activity, smoking and alcohol cessation, weight reduction and management, and a healthy diet. In the current project, stroke risk was reduced by 30% with lifestyle modifications of blood pressure control, weight reduction, and



physical activity. Larsson's (2014) study found a 54% reduction of stroke risk while Chiuve et al (2008) found a 71% risk reduction with maintenance of a healthy diet, moderation of alcohol, smoking cessation, increased physical activity, and lower BMI. Jeon and Jeong's (2015) study found that participants in a stroke prevention program reduced stroke risk factors with an average BMI reduction from 26.22 kg/m<sup>2</sup> to 25.60 kg/m<sup>2</sup>, systolic blood pressure lessened by 3 points, and total cholesterol reduced by 15 mg/dl. The current study resulted in an average of 0.1 kg/m<sup>2</sup> drop in body mass index, an average of a 5-point decrease in systolic blood pressure readings, and an average of a 5-point drop in total cholesterol values in the 60% of participants who had a post-intervention lipid panel drawn.

### **Limitations**

#### **Internal Validity Effects**

This project contained several limitations related to internal validity. Providers were not required to order a second cholesterol value after completion of the project. Only 60% of participants had a final cholesterol value drawn by the end of the project timeline. Because 40% of data collection did not have a repeated cholesterol post-measure, missing data impacted the validity of the pre and post stroke scorecard comparison. This creates a weakness in reporting the risk change pre and post intervention.

Threats to internal validity that were recognized during the development stage of the project that created limitations during intervention and data collection included participants dropping out of the project or not answering the phone, the failure to complete the calendar data, inability to exercise due to unforeseen health troubles, substandard weather preventing outdoor exercise, and self-report of weight, cigarette dependence, and physical exercise. Of the 32 participants who initially underwent on-one-one stroke risk education, 15 people did not answer

the telephone or return voicemails and seven did not participate in the full project intervention. Many participants did not partake in outdoor physical activity partly because the project took place from September to February. The top reasons for physical inactivity included osteoarthritis of the knees or hips, upcoming surgeries (eye and back), high blood pressure, or the use of assistive devices.

### **External Validity Effects**

Limitations to external validity also exist in the project that could have affected generalizability and transferability. Due to convenience sampling and selection bias, the sample of participants is not representative of the general population. The sample consisted of females who were Caucasian, demonstrating less ethnic diversity than the general population. Additional limitations included a small sample size and a short duration of five months.

### **Sustainability of Effects & Plans**

This project consisted of a one-time, 10-15-minute, one-to-one personalized intervention which could negatively affect sustainability of the outcomes. Evidence regarding how many sessions are needed to produce significant outcomes was not discovered. Efforts were made to ensure sustainability after the project. The staff members at the clinic were provided with a brief explanation of general lifestyle alterations to reduce stroke risk in adults. This is important because the study performed by Kilkenny et al. (2016) showed that participant's stroke knowledge was greater immediately following the intervention and significantly lessened after three months. Clinic providers were encouraged to incorporate stroke risk reduction coaching during each patient visit. Additionally, a hard copy of the stroke education material used in the intervention was provided to the project facilitator to be placed in the waiting room or patient rooms.

### **Efforts to Minimize Limitations**

Threats to internal validity were minimized by several different techniques. For those patients who did not answer phone calls, two voicemails were left with a return call-back number to help facilitate participation. Because the student investigator did not try to obtain the completed calendar data for fear of losing patient participation, data collection was taken over the phone. Fifty percent of participants happened to visit the clinic during the intervention period, and efforts were made to minimize attrition by reviewing these patient's charts for accurate data. Each participant was educated regarding their personalized risk factor modifications which could affect internal validity, but this threat was minimized by one student investigator conducting the intervention and gathering data.

### **Interpretation**

#### **Expected & Actual Outcomes**

The expected outcomes of the project were a decrease in stroke risk, smoking cessation, weight reduction, increased physical activity, and obtaining a greater level of stroke knowledge. Actual results included a 30% stroke risk reduction, smoking cessation in 10%, weight reduction in 20%, and an increase in physical activity in 50% of the participants. An unfortunate finding was that after the intervention period, participants still had substandard stroke knowledge and awareness. Sixty percent of the participants missed one or two questions and 40% were unaware where a stroke occurred in the body.

Thirty-two patients met inclusion criteria and underwent one-on-one stroke risk reduction education. Not only was the desired sample size of 35 participants not met due to time constraints, but only ten participants completed the full intervention period. Another factor that affected the results of the study was that 40% of participants did not have updated cholesterol

values post-intervention which impacts the validity of the pre- and post- stroke risk scorecard comparison.

### **Intervention Effectiveness**

In the project, stroke risk was reduced by 30% with lifestyle modifications of blood pressure control, weight reduction, and physical activity. Despite lacking statistical significance, improvements were also validated by an average of 0.1 kg/m<sup>2</sup> drop in body mass index, an average of a 5-point decrease in systolic blood pressure readings, and an average of a 5-point drop in total cholesterol values in the 60% of participants who had a post-intervention lipid panel drawn.

The project intervention was appropriate for the primary care setting because approximately 795,000 Americans suffer a stroke annually, and nearly one in four people will suffer a second stroke within the next year (CDC, 2017). It is a duty of primary care providers to hold responsibility for health promotion and disease prevention. Components of the intervention included content relating to these processes, including blood pressure and diabetes control, smoking cessation, nutrition, physical activity, and weight management. All should be discussed with virtually every patient in the primary care setting.

### **Intervention Revision**

There are intervention modifications that might improve attainment of the outcomes. First, a longer recruitment timeframe would result in achievement of the anticipated sample size. Additionally, providers could have been asked to order a post-intervention cholesterol value. This would result in validity of the scorecard result comparison. The patient could have been asked to return to the clinic for a more accurate weight and blood pressure measurement, giving rise to improvements of internal validity.

**Expected & Actual Impact to Health System, Costs, Policy**

The expected impact of the evidence-based intervention was to reduce stroke risk through lifestyle modification techniques at a low cost while attaining stroke awareness. The actual impact resulted in a 30% reduction in stroke risk after implementation of the intervention with substandard knowledge regarding stroke. Stroke incidence is increasing and kills approximately 135,000 Americans each year, accounting for 1 in every 20 deaths (CDC, 2017). Along with this, the majority of the community is unaware of their stroke risk, hence the importance of education regarding primary stroke prevention (Dearborn & McCullough, 2009; Gomes et al., 2016; Itzhaki et al., 2016; Stroebele et al., 2011). There is high quality evidence that is statistically significant to support stroke education in relation to stroke risk reduction.

The initial anticipated cost for the project was \$437.26. The actual cost of the project was \$227. Of this amount, \$160 was used to create posters for dissemination and travel expenses to conferences. Therefore, \$67 was actually spent on materials and supplies for the intervention. There was not a funding source for the study given the small amount of money needed. Due to the low cost of the study, there is vast potential for economic sustainability.

**Conclusion**

If people are unaware that a preventative lifestyle can reduce the incidence of stroke, there will not be an inclination to change behavior. Current research indicates people have poor stroke knowledge and perception of their own stroke risk. Stroke literature reviewed in this paper supports the proposed evidence-based project aimed at decreasing stroke risk via patient education. This project has the potential to improve healthcare and stroke risk at a local level as well as from a public health standpoint. Maintaining a healthy lifestyle by increasing physical activity, decreasing weight, and abstaining from smoking can considerably reduce stroke risk. At

the completion of the synthesis of evidence, further research is needed to determine the relationship between BMI and stroke, as evidenced by recent research findings of an association with waist-to-hip ratio, instead of BMI, with an increased total stroke risk. Dissemination of the project included poster presentations at the Advanced Practice Nurses of the Ozarks Conference in November of 2018 in Branson, Missouri and at the Midwest Nursing Research Society's 43<sup>rd</sup> Annual Research Conference in March of 2019 in Kansas City, Missouri. The burden of stroke incidence continues to affect Americans who are generally unaware of their stroke risk. There is high quality evidence that is statistically significant to support stroke education in relation to stroke risk reduction.

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## Appendix A

## Definition of Terms

Stroke: a “brain attack” that takes place when the blood flow to the brain is cut off and brain cells die from deprivation of oxygen (National Stroke Association, 2014)

Ischemic Stroke: manifests when a clot blocks blood flow within the brain (National Stroke Association, 2014)

Hemorrhagic Stroke: occurs when weakened blood vessels leak, causing a pooling of blood in the brain (National Stroke Association, 2014)

Transient Ischemic Attack: a brief episode of neurologic dysfunction resulting from an interruption in blood supply to the brain, resolving within minutes to hours (National Stroke Association, 2014)

Body Mass Index: a measure of body fat based on weight in relation to height. People are considered overweight if their BMI ranges from 25 to 29.9 kg/m<sup>2</sup> and are obese if BMI is greater than 30 kg/m<sup>2</sup> (Kroll et al., 2016)

Evidence-Based Practice: a problem-solving approach to clinical practice that uses a systematic search for the most pertinent research (MeInyk & Fineout-Overhold, 2015)

## Appendix B

<b>Rating System for the Hierarchy of Evidence For an Interventional Inquiry</b> (Modification by Dr. Lindholm for course N5613)	
Level I	Evidence from a systematic review or meta-analysis of all relevant RCTs. <i>Evidence-based clinical practice guidelines based on systematic reviews of RCTs).</i> *
Level II	Evidence obtained from well-designed RCT. <i>Quantitative systematic review of well-designed controlled trial without randomization.</i>
Level III	Evidence obtained from well-designed controlled trial without randomization ( <i>quasi-experimental</i> ). <i>Quantitative systematic review of case-control, cohort, or correlational studies.</i>
Level IV	Evidence from well-designed case-control or cohort study ( <i>or cross-sectional study</i> )
Level V	Evidence from systematic review of <i>quantitative</i> descriptive ( <i>no relationships to examine</i> ) or qualitative studies.
Level VI	Evidence from a single <i>quantitative</i> descriptive ( <i>no relationships to examine in the study</i> ) or qualitative study
Level VII	Evidence from the opinion of authorities and/or reports of expert committees

Melnyk, B.M. & Fineout-Overholt, E. (2015). *Evidence-based practice in nursing and healthcare*. Philadelphia Lippincott Williams & Wilkins.

*\*Italics, appropriate in this category, modification by LL 2017 based on opinions from experts to place SR at one level higher than single study design level.*

## Appendix C

PICOTS: In adults 55 and older who score in the <i>caution or high</i> category of the National Stroke Association's stroke risk scorecard, does primary stroke prevention education aimed at lifestyle modification and behavior change, as compared to before receiving education, increase stroke knowledge and decrease primary stroke risk over a 6-month period at an outpatient family care clinic?						
First author, Year, Title, Journal	Purpose	Research Design, Evidence Level & Variables	Sample & Sampling, Setting	Measures & Reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
<b>Subtopic: Primary stroke prevention, combination of smoking, weight and physical activity</b>						
Jeon (2015). Effects of a stroke primary prevention program on risk factors for at-home elderly. Medical Science Monitor.	To evaluate a nursing intervention to prevent stroke in at-risk elderly living at home	Quantitative, randomized control trial (RCT), level 2. Dependent: stroke risk Independent: nursing intervention	93 elderly patients living in E providence with 1 or more stroke risk factors. Convenience sampling.	Measurements of blood pressure (BP), blood samples, height and weight.	Average BMI was reduced from 26.22 to 25.60, SBP dropped 3 points, fasting blood sugar dropped an average of 29, total cholesterol reduced by 15, & triglycerides decreased 21. Chi-square test, t-test	Limitations not stated. Usefulness: participating in a stroke prevention program enabled at-risk elderly participants to perform health-promoting behaviors.
Larsson (2014). Healthy diet and lifestyle and risk of stroke in a prospective cohort of	To explore the relationship between a low-risk lifestyle and risk of stroke.	Quantitative, cohort, level 4. Dependent: stroke risk Independent: diet, alcohol intake,	31,696 women in the Swedish Mammography Cohort free from CVD and cancer.	Questionnaires	Maintenance of healthy diet, moderate alcohol, smoking, PA, BMI had 62% lower chance of ischemic stroke & 54%	Limitations: observational design, self-reporting. Usefulness: low-risk lifestyle can reduce the risk of

women. American Academy of Neurology.		tobacco use, PA, BMI	Convenience sampling.		lower risk of total stroke. Cox proportional hazards regression	stroke, especially cerebral infarction
Bell (2013). Pre-stroke factors associated with post-stroke mortality & recovery in older women in the Women's Health Initiative. Journal of the American Geriatrics Society.	Examine pre- stroke lifestyle with post-stroke mortality & recovery rates.	Quantitative, longitudinal prospective cohort study, level 4. Dependent: post-stroke mortality. Independent: smoking, physical activity (PA).	161,808 of the Women's Health Initiative participants, postmenopausal women aged 50-79, stroke- free at baseline 93'-98', with stroke occurrence before 2005. 40 clinical centers around US.	Physical exam, questionnaires. medical record review, post- stroke Glasgow outcomes scale (GOS). Reliability: study neurologists reviewed & confirmed strokes	Pre stroke smoking doubled post- stroke mortality risk. Past smoking increased stroke risk by 49%. Physical inactivity had 1.4 increased risk of stroke vs 150+ min/wk, with 39% increased risk of post-stroke mortality. Cox proportional hazards model	Limitations: not all strokes types due to death before imaging, only hospitalized strokes included. Usefulness: modifiable risk factors of smoking and PA can reduce mortality from stroke in older women.
Kulshreshtha (2013). Life's Simple 7 (LS7) and risk of incident stroke: reasons for geographic and racial differences in stroke	Association between LS7 and incidence of stroke	Quantitative, cohort, level 4. Dependent: incidence of stroke. Independent: BP, cholesterol, glucose, BMI, smoking, PA, diet.	22,914 people aged >45 years in the US with no previous CVD. Longitudinal sampling.	Data collected by telephone, questionnaires, Food Frequency Questionnaire, and an in-home exam.	Average health associated with a 28% decreased stroke risk, optimal health had 47% decreased risk. Those with 1 ideal component vs. 0 had 30% reduced risk, those with 6	Limitations: health factors & behavior measured only once, participation rate was 49%, use of a modified definition for PA and diet. Usefulness: in both blacks & whites,



(REGARDS) study. Stroke.					vs. 0 had 66% reduced risk. Chi-square, Cox proportional	better CV health is associated with lower risk of stroke.
Zhang (2013). Ideal cardiovascular health metrics and the risks of ischemic and intracerebral hemorrhagic stroke. Stroke.	To investigate the relationship between cardiovascular health measures & risk of stroke.	Quantitative, cohort study, level 4. Dependent: stroke risk. Independent: cardiovascular health measures	91,698 participants free from heart attack or stroke. Tangshan, China. Longitudinal sampling.	Questionnaires, clinical & lab exams. Reliability: blinded physicians to complete follow-up clinical assessments every 2 years, results were confirmed by chart review.	Smoking associated with 40% increased risk. BMI >25 had 24% increased stroke risk. Those not averaging 30+ min/d of moderate PA had 40% increased stroke risk. Cox proportional hazards regression, ANOVA.	Limitations: selection bias-industrial city-increase number of manual workers; did not use validated dietary & PA questionnaires; lack of detailed imaging information on subtypes of ischemic stroke.
Goldstein (2011). Guidelines for the primary prevention of stroke: A guideline for healthcare professionals from the AHA/ASA. Stroke	Overview of evidence on risk factors for stroke and provide recommendation on reduction of primary stroke risk.	Guidelines, level 1. Dependent: stroke risk. Independent: modifiable and nonmodifiable risk factors	N/A	Reliability: peer review by the Stroke Council leadership and AHA committees.	80% lower risk of 1 <sup>st</sup> stroke in those who practice healthy lifestyles. Annual number of stroke deaths from smoking is 12-14%. active people have 25-30% lower risk of stroke.	N/A

Zhang (2011). Lifestyle factors on the risks of ischemic and hemorrhagic stroke. Archives of Internal Medicine.	To assess the effects of different lifestyle factors on stroke risk	Quantitative, prospective cohort, level 4. Dependent: stroke risk. Independent: smoking, BMI, PA, vegetable intake, alcohol consumption	36,686 Finnish people aged 25-74 years old free of coronary heart disease & stroke. Convenience sampling	Five independent cross-sectional population surveys.	Current/past tobacco users had 36% increased risk of stroke, 28% risk for ischemic & 57% risk for hemorrhagic stroke. BMI > 30 had 1.5 increased ischemic stroke risk. Cox proportional hazards.	Limitations: self-report, vegetable intake alone was measured, , each healthy lifestyle factor was weighted the same, potential interaction between each factor and stroke risk was not assessed
O'Donnell (2010). Risk factors for ischaemic & intracerebral haemorrhagic stroke in 22 countries (the INTER-STROKE study): a case-control study. The Lancet.	Establish link between risk factors with stroke, and the influence on stroke burden	Quantitative, standardized, case-control, level 4. Dependent: stroke risk Independent: risk factor of smoking & PA.	22 countries from 2007-2010, 3,000 people with stroke. Random sampling	Questionnaire, physical exam, modified-Rankin scale. Reliability: Pearsons test	Tobacco use connected with twice amount of stroke risk. Logistics regression, t-test, multivariate model	Limitations: selection & recall bias, use of proxy respondents, controls from community & hospital-based, Usefulness: Interventions that reduce risk could reduce burden of stroke.
Chiuve (2008). Primary prevention of stroke by healthy	Explore the impact of multiple lifestyle factors on risk of stroke	Quantitative, prospective cohort, level 4. Dependent: stroke risk.	43,685 men & 71,243 women from 1984-2004.	Self-reported questionnaires, summary diet score. Reliability:	Those who adhere to a healthy lifestyle have 71% reduced stroke risk. Cox	Limitations: self-reported measurement error, confounding variables.

lifestyle. Circulation.		Independent: healthy lifestyle	Convenience sampling.	blinded physicians reviewed medical records	proportional hazards model	Usefulness: Adherence to a low-risk lifestyle will prevent stroke, especially ischemic
<b>Subtopic: Risk factor of cigarette smoking</b>						
Edjoc (2013). The prognostic effect of cigarette smoking on stroke severity, disability, length of stay in hospital, & mortality in a cohort with CVD. Journal of Stroke & CV Diseases.	To determine the influence of cigarette smoking on stroke severity, disability, and mortality in stroke.	Quantitative, cohort, level 4. Dependent: stroke severity, disability & mortality. Independent: smoking.	20,523 patients The Registry of the Canadian Stroke Network. Convenience sampling.	Canadian Neurological Scale, modified Rankin scale	Within 30 days of former tobacco use, there was a favorable impact in reducing stroke risk and mortality. Univariate & multivariable logistic regression, independent one- way analysis of variance and chi- square tests.	Limitations: data obtained from registry with homogenous operating procedures, self- reporting. Usefulness: Former smoking had positive impact in reducing risk of severe stroke & mortality risk at 30 days.
Peters (2013). Smoking as a risk factor for stroke in women compared with men: A systematic review & meta- analysis of 81 cohorts, including 3980359	Determine if men or women who smoke are of greater risk for stroke	Quantitative, systematic review with meta-analysis of cohorts. Level 5. Dependent: men's stroke risk, women's stroke risk. Independent: smoking	81 cohorts, 3,980,359 people, 42,401 strokes. Longitudinal, sampling.	Random- effects meta- analysis with inverse variance weighting	Smoking associated with 83% increased risk in women, 67% in men. Men & women have an equal chance of acquiring a smoking-related stroke. I <sup>2</sup> statistic.	Limitations: lack of standardization in study design & duration, end point definition, study population, classification of reference group of smoking, amount of adjustment for confounders; sparse

individuals & 42401 strokes. Stroke.						studies on duration of smoking.
<b>Subtopic: Risk factor of BMI</b>						
Kroll (2016). Adiposity and ischemic and hemorrhagic stroke: prospective study in women and meta-analysis. American Academy of Neurology.	To compare associations of BMI with ischemic and hemorrhagic stroke risk, and to review worldwide evidence.	Quantitative, systematic review, meta-analysis of cohorts, level 5 & quant., cohort, level 4. Dependent: increased stroke risk Independent: BMI	1.3 million stroke-free women from 1996-2001 using electronic health records in England and Scotland. Systematic review: 12 studies.	NHS data, electronic hospital records.	1.2 times greater stroke risk per 5 kg/m <sup>2</sup> increase in BMI. Lower BMI had 11% decreased risk of hemorrhagic stroke. Cox regression	Limitations: Measurement error, hemorrhagic strokes more likely than ischemic to result in hospital admission or death.
<b>Subtopic: Risk factor of physical activity</b>						
McDonnell (2013). Physical activity frequency and risk of incidence stroke in a national US study of blacks and whites. Stroke.	Comparison of self-reported PA with stroke incidence.	Quantitative, prospective cohort study, level 4. Dependent: risk of stroke Independent: PA	30,239 Americans aged >45. Southeastern United States. Longitudinal sampling.	Telephone interview, in-home visit, questionnaires. Reliability: Reports of stroke confirmed by 2 stroke physicians that meets WHO definition	Physical inactivity (PI) had 1.2x increased stroke risk. Men who exercised 1-3x/wk vs. to 4+/wk were 1.3x more likely to develop stroke. 0-3x/wk vs. 4x/wk had 1.2 increased risk. Cox proportional	Limitations: PA measurements; underestimates of actual PA performed; PA measure does not quantify duration or type; change of PA habits.

Diep (2010). Association of PA level & stroke outcomes in men & women: a meta-analysis. <i>Journal of Women's Health</i> .	Association between PA and stroke risk outcomes, and discover difference between men & women	Quantitative, systematic review, meta-analysis of cohort studies, level 5. Dependent: stroke risk Independent: PA	13 studies published from 1986-2005	Reliability: epidemiologist/physician & biostatistician independently reviewed. Cochrane's $Q=13.728$ , $df 12$ , $p=0.318$	Moderate PA in men showed 12% reduction in risk & 19% reduction for high PA. 24% reduction for high PA in women. Random-effects meta-analysis	Limitations: few studies on topic, self-reporting of measures & varying definitions of PA.
Sattelmair (2010). Physical activity and risk of stroke in women. <i>Stroke</i> .	Discover the amount and kinds of PA related to stroke risk.	Quantitative, prospective cohort, level 4 Dependent: stroke risk. Independent: PA	39,315 US women aged >45 years from the Women's Health Study. Convenience sampling.	Questionnaires. Reliability: chart review completed by neurologists	Those who walked >2h/w had 30% lower stroke risk. When walking pace is brisk (>4.8km/hr), 37% lower risk. Cox proportional	Limitations: observational design, self-reporting measures, limited to leisure-time PA, sample selection bias.
<b>Subtopic: Stroke knowledge</b>						
Gomes (2016). Popular stroke knowledge in Brazil: A multicenter survey during "World Stroke Day." <i>eNeurological Sci</i>	Identify knowledge of recognition, treatment and prevention of stroke	Qualitative, retrospective, cross-sectional. Level 4. Dependent: stroke knowledge Indep.: stroke recognition, treatment, prevention	658 participants, 1213 sets of answers. Brazil. Convenience sampling.	Stroke Campaign Questionnaire.	43.9% people knew aware of stroke, 35% knew 3+ risk factors. 28.8% knew a preventative measure. Descriptive statistics.	Limitations: convenience sample; selection bias d/t average age and education level; lack of information about percentage of people who refused to answer questionnaire.

<p>Itzhaki (2016). Gender differences in feelings and knowledge about stroke. Journal of Clinical Nursing.</p>	<p>To examine gender differences in knowledge and feelings about stroke</p>	<p>Quantitative and qualitative, cohort, level 4. Dependent: perception of risk. Independent: personal feelings &amp; knowledge</p>	<p>177 people older than 40 years old with no history of stroke in Israel. Convenience sampling.</p>	<p>Semi-structured personal interviews, questionnaires. Reliability: 8 RNs in the masters APRN program conducted the interviews and transcriptions.</p>	<p>41.8% of men &amp; 25.5% of women named HTN as risk factor, 36.7% of men &amp; 18.4% of women said current smoking, &amp; 62% of men &amp; 55.1% of women said PA &lt;2x/week. 1% of women &amp; 3.8% of men never heard of it. 12.7% of men &amp; 8.2% of women heard of it but did not know what it is. 5% of men &amp; 6.1% of women recalled inaccurate causes of stroke. Chi-square test</p>	<p>Limitations: limited generalizability due to convenience sampling, cultural or ethnic factors were not examined. Usefulness: Stroke knowledge is poor among men and women.</p>
<p>Kilkenny (2016). Improving stroke knowledge through a 'volunteer-led' community education program in</p>	<p>To determine the change of stroke knowledge after attending a StrokeSafe Ambassador Education program.</p>	<p>Qualitative, cohort, level 4. Dependent: perception of stroke risk. Independent: knowledge of risk factors.</p>	<p>591 people who attended 42 StrokeSafe programs in Australia. Convenience sampling.</p>	<p>Questionnaires</p>	<p>Increase in knowledge pre-presentation vs immediately post: 14 people for smoking, 16 for obesity, 19 for lack of exercise. Pre-presentation vs 3 mos after: 8, 9, &amp;</p>	<p>Limitations: no control group, selection bias, overall lack of ethnic diversity, self-reporting. Usefulness: community presentations can improve immediate</p>

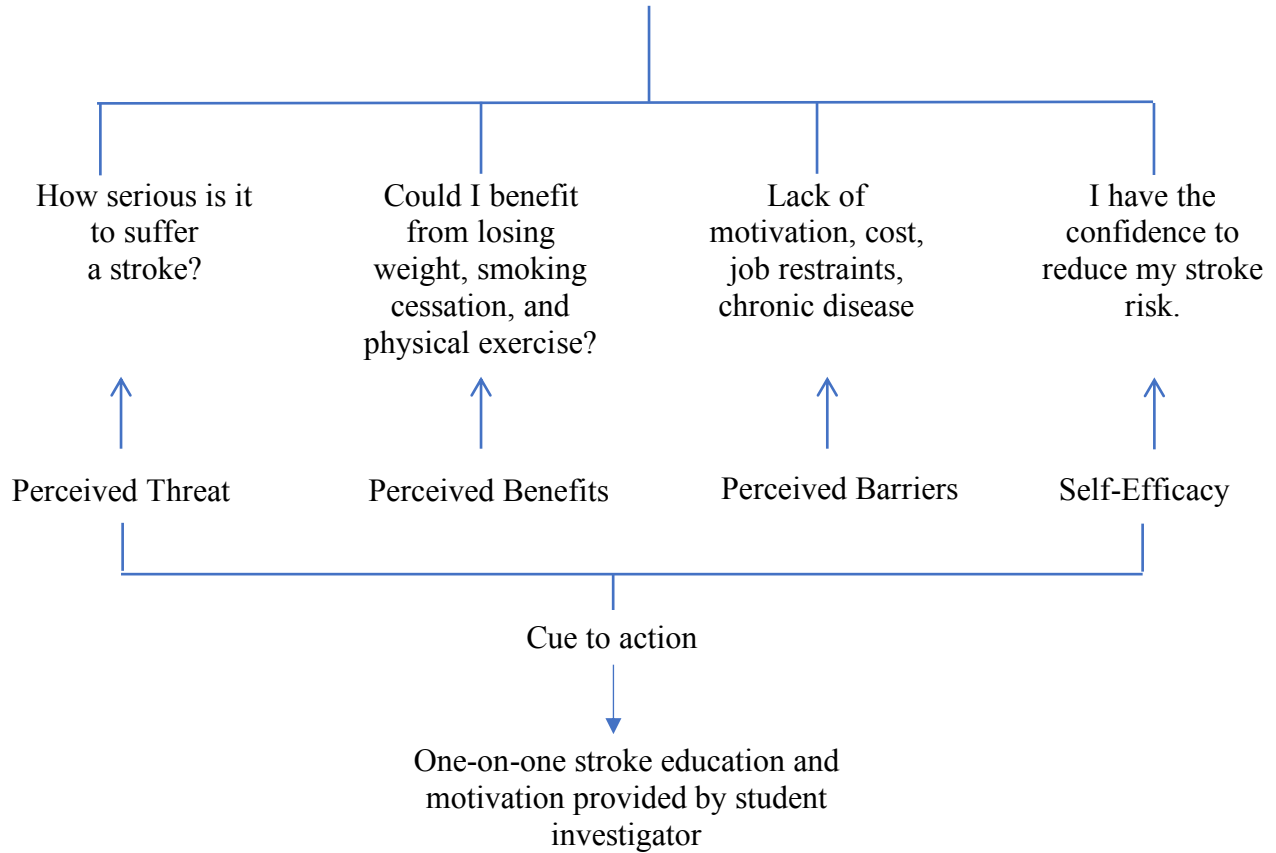
Austria. Preventative Medicine.					7 people, respectively. McNemar's test, chi-square test	and short-term knowledge of signs and risk factors for stroke.
Stroebele (2011). Knowledge of risk factors, and warning signs of stroke: a systematic review from a gender perspective. International Journal of Stroke.	Review existing literature that assessed knowledge of stroke risk factors and warning signs.	Qualitative, systematic review of qualitative studies, level 5. Dependent: stroke knowledge. Independent: stroke risk factors & warning signs.	22 studies from U.S., Canada, Europe, Germany, Australia, Asia, Africa, & Brazil.	Reliability: 2 independent investigators reviewed each study for eligibility.	60-86% could recall 1 stroke risk factor. Men named more behavioral risk factors (alcohol & PA), while women named medical reasons (HTN, CVD, DM).	Limitations: studies only in English or German were included- publication bias, meta-analysis was not practical due to heterogeneity & lack of adequate reporting, participant's age varied, recalling of risk factors.
Dearborn (2009). Perception of risk & knowledge of risk factors in women at high risk for stroke. Stroke.	To incorporate theory to understand stroke risk factors & risk perception in high-risk women.	Qualitative, cohort, level 4. Dependent: perception of risk. Independent: personal risk factors & knowledge	215 women, ages 50-70 from the University of Connecticut Cardiology Center with at least 1 risk factor of stroke. Convenience sampling.	5-part questionnaire	62.8% of women recognized smoking, 56.7% obesity, & 47.4% lack of exercise as risk factors. Descriptive, bivariate & multivariate, linear regression.	Limitations: selection bias, underreporting, lack medical terminology knowledge. Usefulness: stroke risk perception is low, women do not identify their condition as risk factors.

Appendix D

Health Belief Model

Mode of Adaptation

Living with stroke risk factors





## Appendix E

## IRB Approval Letter

**From:** UMKC IRB <umkcirb@umkc.edu>  
**Sent:** Friday, September 7, 2018 10:56 AM  
**To:** Lindholm, Lyla J. and Leinenbach, Kalie L. (UMKC-Student)  
**Subject:** 18-200- Not Human Subjects Research Determination Notification

It has been determined that the protocol referenced below does not meet the definition of research with human subjects set forth in Federal Regulations at 45 CFR 46.102. Please go to <https://umkc.keyusa.net> and login to eProtocol to access the formal determination letter in the event history for this study.

Protocol ID: 18-200  
Principal Investigator: Lyla Lindholm  
Protocol Title: Stroke Education to Reduce Adult Stroke Risk: An Evidence-Based Quality Initiative  
NHSR

If you have any questions about this determination, please contact the Research Compliance Office (email: [umkcirb@umkc.edu](mailto:umkcirb@umkc.edu); phone: (816)235-5927).

## Appendix F

## Cost Table

<b>Item</b>	<b>Item Description</b>	<b>Cost</b>	<b>Quantity</b>	<b>Anticipated Cost</b>
Materials	Folders (20 pack)	\$18.81	3	\$56
	Office paper (500 count)	\$5.69	2	\$11
Poster	Poster #1	\$60	1 each	\$100
	Poster #2	\$40		
Dissemination	Travel expenses	\$60	N/A	\$60
<b>Total</b>				\$227

Appendix G

Logic Model for DNP Project					
Student: Kalie Leinenbach					
Inquiry, PICOTS: In adults 18 and older who score in the <i>caution or high</i> category of the National Stroke Association's stroke risk scorecard, does primary stroke prevention education aimed at lifestyle modification and behavior change, as compared to before receiving education, increase stroke knowledge and decrease primary stroke risk over a 5-month period at an outpatient family care clinic?					
Inputs	Intervention(s)	Outputs	Outcomes -- Impact		
	Activities	Participation	Short	Medium	Long
<p><b>Evidence, sub-topics</b></p> <ol style="list-style-type: none"> <li>Stroke knowledge</li> <li>Primary stroke prevention</li> <li>Smoking cessation</li> <li>Physical activity</li> <li>Obesity</li> </ol> <p><b>Major Facilitators or Contributors</b></p> <ol style="list-style-type: none"> <li>Michelle Petersen, FNP</li> <li>The National Stroke Association's stroke risk scorecard</li> <li>National guideline recommendations</li> </ol> <p><b>Major Barriers or Challenges</b></p> <ol style="list-style-type: none"> <li>Patient's education level</li> <li>Cost</li> <li>Extra time needed during office visit</li> <li>Lack of participant's participation or follow-up</li> </ol>	<p><b>EBP intervention which is supported by the evidence in the Input column</b></p> <p>One-on-one education and written material sent home with patient</p> <p><b>Major steps of the intervention</b></p> <ol style="list-style-type: none"> <li>Stroke risk assessment via scorecard</li> <li>One-on-one education of stroke risks</li> <li>Written material sent home with patient</li> <li>Follow-up phone calls</li> <li>Post-intervention knowledge survey</li> </ol>	<p><b>The participants (subjects)</b></p> <p>Adults 18 and older who score in the <i>caution or high</i> category of the scorecard</p> <p><b>Site</b></p> <p>a primary care clinic in Missouri</p> <p><b>Time Frame</b> Aug.- Dec. 2018</p> <p><b>Consent or assent Needed</b> Yes</p> <p><b>Other person(s) collecting data (yes,no)</b> Yes, preceptor</p> <p><b>Others directly involved in consent or data collection (yes/no)</b> Yes- nurse obtaining vital signs</p>	<p><b>(Completed during DNP Project)</b></p> <p><b>Outcome(s) to be measured</b></p> <p>Primary: reduced stroke risk, increased stroke knowledge</p> <p>Secondary: increase in physical activity, smoking cessation, reduction of BMI</p> <p><b>Measurement tools</b></p> <ol style="list-style-type: none"> <li>The National Stroke Association's stroke risk scorecard</li> <li>National Institute of Health's stroke knowledge test</li> <li>Numerical data (blood pressure, cholesterol, BMI)</li> </ol> <p><b>Statistical analysis to be used</b></p> <p>Wilcoxon signed ranks test, descriptive analysis, chi-squared tests,</p>	<p><b>(after student DNP)</b></p> <p><b>Outcomes to be measured</b></p> <p>Healthier lifestyle choices regarding smoking cessation, weight control, and exercise</p>	<p><b>(after student DNP)</b></p> <p><b>Outcomes that are potentials</b></p> <p>A reduction in stroke disability and mortality</p>

Appendix H

Educational Material



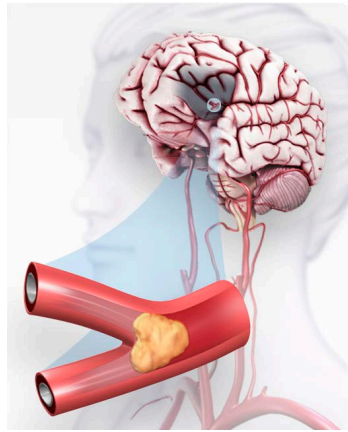
let's talk about

## Stroke, TIA and Warning Signs

Stroke occurs when a blood vessel bringing blood and oxygen to the brain gets blocked by a clot or ruptures. When this happens, brain cells don't get the blood and oxygen that they need to survive. This causes nerve cells stop working and die within minutes. Then, the part of the body they control are affected.

The effects of stroke may be permanent depending on how many cells are lost, where they are in the brain, and other factors. Strokes can cause weakness (paralysis), affect language and vision, and cause other problems.

Stroke is the No. 5 cause of death and a leading cause of serious, long-term disability in America.



### What is a TIA?

TIA, or transient ischemic attack, is a "minor or mini stroke" that occurs when a blood clot blocks an artery for a short time. The symptoms of a TIA are the same as those of a stroke, but they usually last only a few minutes. About 15 percent of major strokes are preceded by TIAs, so don't ignore a TIA. **Call 9-1-1 or seek emergency medical attention immediately!**

### Is stroke preventable?

Yes. Stroke is largely preventable. You can reduce your stroke risk by living a healthy lifestyle — controlling high blood pressure; not smoking; eating a healthy diet low in saturated and *trans* fats; being physically active; maintaining a healthy body weight; managing diabetes; and drinking alcohol moderately or not at all.

### Can stroke be treated?

If you're having a stroke, time is critical. Immediate treatment may minimize the long-term effects of a stroke

and even prevent death. Treatment will vary depending on what type of stroke you had.

There is a clot-dissolving drug called IV Alteplase (tPA) to treat stroke. It can stop a stroke in progress and reduce disability from stroke by breaking up a blood clot that might be stopping the flow of blood to the brain. To be eligible for Alteplase, you must seek emergency treatment right away and have a clot-caused stroke. It must be given within 3 to 4.5 hours after symptoms start. The sooner it is given, the greater the possibility of a better outcome.

Another treatment option is called a **mechanical thrombectomy**. In this procedure, specially trained doctors try to remove the blood clot by using a wire-cage device called a **stent retriever**. To remove the clot, doctors thread a catheter (thin tube) with a stent through an artery in the groin up to the blocked artery in the brain. The stent opens and grabs the clot. The doctors then remove the stent with the trapped clot.

*(continued)*



Stroke, TIA and Warning Signs

This must be done within six hours to 24 hours of the first symptoms of stroke and only after the patient has received IV Alteplase. Patients must meet certain criteria to be eligible for this procedure.

### What are warning signs of stroke?

You and your family should recognize the warning signs of stroke. You may have some or all of these signs. Note the time when symptoms start and call 9-1-1 or the emergency medical number in your area immediately. Stroke is a medical emergency!

Don't ignore these warning signs, even if they go away.

#### Stroke Warning Signs:

- Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- Sudden confusion, trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden severe headache with no known cause



**F.A.S.T.** is an easy way to remember how to recognize a stroke and what to do. Spot a stroke FAST: **F**ace drooping, **A**rm weakness, **S**peech Difficulty, **T**ime to call 9-1-1.



### HOW CAN I LEARN MORE?

- 1 Call 1-888-4-STROKE (1-888-478-7653) to learn more about stroke or find local support groups, or visit [StrokeAssociation.org](http://StrokeAssociation.org).
- 2 Sign up to get Stroke Connection magazine, a free magazine for stroke survivors and caregivers at [strokeconnection.org](http://strokeconnection.org).
- 3 Connect with others sharing similar journeys with stroke by joining our Support Network at [strokeassociation.org/supportnetwork](http://strokeassociation.org/supportnetwork).

### Do you have questions for the doctor or nurse?

Take a few minutes to write your questions for the next time you see your healthcare provider.

For example:

**Which facility close to me is best equipped to treat me if I am having stroke symptoms?**  
**How can I reduce my risk for stroke?**

### My Questions:

We have many other fact sheets to help you make healthier choices to reduce your risk, manage disease or care for a loved one. Visit [strokeassociation.org/letstalkaboutstroke](http://strokeassociation.org/letstalkaboutstroke) to learn more.



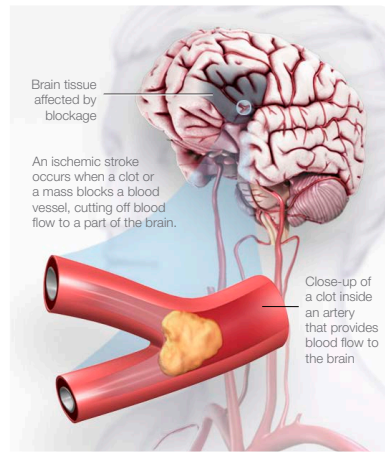
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let's talk about **stroke**



let's talk about  
**Ischemic Stroke**

The majority of strokes occur when blood vessels to the brain become narrowed or clogged with fatty deposits called plaque. This cuts off blood flow to brain cells. A stroke caused by lack of blood reaching part of the brain is called an ischemic stroke. High blood pressure is a leading risk factor for ischemic stroke that you can change.



**Are all ischemic strokes the same?**

There are two types of ischemic strokes.

- **Thrombotic strokes** are caused by a blood clot (thrombus) in an artery going to the brain. The clot blocks blood flow to part of the brain. Blood clots usually form in arteries damaged by plaque.
- **Embolic strokes** are caused by a wandering clot (embolus) that's formed elsewhere (usually in the heart or neck arteries). Clots are carried in the bloodstream and block a blood vessel in or leading to the brain.

**How are ischemic strokes diagnosed?**

When someone has shown symptoms of a stroke or a TIA (transient ischemic attack), a doctor will gather information and make a diagnosis. He or she will review the events that have occurred and will:

- get a medical history from you or a family member.
- do a physical and neurological examination.
- have certain lab (blood) tests done.
- get a CT (computed tomography) or MRI (magnetic

resonance imaging) scan of the brain.

- study the results of other diagnostic tests that might be needed.

**How are ischemic strokes treated?**

**Acute treatment** is the immediate treatment given by the healthcare team when a stroke happens. The goal of acute treatment is to keep the amount of brain injury as small as possible. This is done by restoring blood flow to the part of the brain where the blockage was quickly.

There is a clot-dissolving drug called IV Alteplase (tPA) to treat stroke. It can stop a stroke in progress and reduce disability from stroke by breaking up a blood clot that might be stopping the flow of blood to the brain. To be eligible for Alteplase, you must seek emergency treatment right away and have a clot-caused stroke. It must be given within 3 to 4.5 hours after symptoms start. Medication may also be used to treat brain swelling that sometimes occurs after a stroke.

For people with blood clots in larger arteries, Alteplase may not dissolve them completely. In this case, a

*(continued)*

let's talk about **stroke**



Ischemic Stroke

procedure, called **mechanical thrombectomy**, should be done within six to 24 hours of the first symptoms of stroke. In most cases this is done only after the patient receives IV Alteplase. To remove the clot, doctors thread a catheter (thin tube) with a stent through an artery in the groin up to the blocked artery in the brain. The stent opens and grabs the clot. The doctors then remove the stent with the trapped clot. If necessary, other devices may also be used. Patients must meet certain criteria to be eligible for this procedure.



Aspirin can play an important role in preventing stroke because it helps keep blood from clotting.

When someone has a stroke, they are at risk of another. Once the medical team identifies what caused the stroke, they may prescribe treatments or procedures to reduce the risk of a second stroke, such as:

- Antiplatelet agents, such as aspirin and clopidogrel, and anticoagulants interfere with the blood's ability to clot. This can play an important role in preventing a stroke.
- Carotid endarterectomy is a procedure in which blood vessel blockage (blood clot or fatty plaque) is surgically removed from the carotid artery in the neck. This reopens the artery and the blood flow to the brain. This is only done in people who have a large blockage.
- Doctors sometimes use balloon angioplasty and

implantable steel screens called stents to treat and reduce fatty buildup clogging a vessel that may make it easy for clots to form in the bloodstream.

Sometimes a stroke is the first sign a person has of other health conditions, such as high blood pressure, diabetes, atrial fibrillation (a heart rhythm disorder), or other vascular disease. If any of these are diagnosed, the healthcare team will prescribe appropriate treatment.

**HOW CAN I LEARN MORE?**

- 1 Call 1-888-4-STROKE (1-888-478-7653) to learn more about stroke or find local support groups, or visit [StrokeAssociation.org](http://StrokeAssociation.org).
- 2 Sign up to get *Stroke Connection* magazine, a free magazine for stroke survivors and caregivers at [strokeconnection.org](http://strokeconnection.org).
- 3 Connect with others sharing similar journeys with stroke by joining our Support Network at [strokeassociation.org/supportnetwork](http://strokeassociation.org/supportnetwork).

**Do you have questions for the doctor or nurse?**

Take a few minutes to write your questions for the next time you see your healthcare provider. For example:

- What can I do to help prevent another stroke?**
- What medications may I be given?**


**My Questions:**


We have many other fact sheets to help you make healthier choices to reduce your risk, manage disease or care for a loved one. Visit [strokeassociation.org/letstalkaboutstroke](http://strokeassociation.org/letstalkaboutstroke) to learn more.



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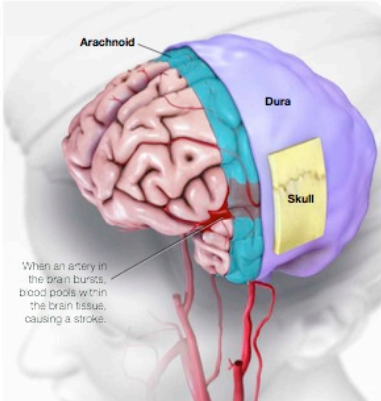
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Life is why™

let's talk about  
**Hemorrhagic Stroke**

About 13 percent of strokes happen when a blood vessel ruptures in or near the brain. This is called a hemorrhagic stroke as shown at right.

When a hemorrhagic stroke happens, blood collects in the brain tissue. This is toxic for the brain tissue causing the cells in that area to weaken and die.



A type of hemorrhagic stroke, known as a subarachnoid hemorrhage, can occur when an aneurysm (a blood-filled pouch that balloons out from an artery) on or near the surface of the brain ruptures, flooding the space between the skull and the brain with blood.

**Are all hemorrhagic strokes the same?**

There are two kinds of hemorrhagic stroke. In both, a blood vessel ruptures, disrupting blood flow to part of the brain.

**Intracerebral hemorrhages** (most common type of hemorrhagic stroke):

- Occur when a blood vessel bleeds or ruptures into the tissue deep within the brain.
- Are most often caused by chronically high blood pressure or aging blood vessels.
- Are sometimes caused by an arteriovenous malformation (AVM). An AVM is a cluster of abnormally formed blood vessels. Any one of these vessels can rupture, also causing bleeding into the brain.

**Subarachnoid hemorrhages:**

- Occur when an aneurysm (a blood-filled pouch that balloons out from an artery) on or near the surface of the brain ruptures and bleeds into the space between the brain and the skull.
- Are often caused by high blood pressure.

In addition to high blood pressure, factors that increase the risk of hemorrhagic strokes include:

- cigarette smoking
- use of oral contraceptives (particularly those with high estrogen content)
- excessive alcohol intake
- use of illegal drugs

*(continued)*

let's talk about **stroke**  Prevention

Hemorrhagic Stroke

**How are hemorrhagic strokes diagnosed?**

When someone has shown symptoms of a stroke or a TIA (transient ischemic attack), a doctor will gather information and make a diagnosis. He or she will review the events that have occurred and will:

- get a medical history
- do a physical and neurological examination
- have certain laboratory (blood) tests done
- get a CT or MRI scan of the brain
- study the results of other diagnostic tests that might be needed

Diagnostic tests examine how the brain looks, works and gets its blood supply. They can outline the injured brain area. Diagnostic tests fall into three categories.

- Imaging tests give a picture of the brain similar to X-rays.
- Electrical tests record the electrical impulses of the brain (also called an EEG).
- Blood flow tests show any problem that may cause changes in blood flow to the brain.

**How are hemorrhagic strokes treated?**

Because hemorrhages may be life-threatening, hospital care is required. Medication is used to control high blood pressure. Other medicine may be given to reduce the brain swelling that follows a stroke.

Surgery may be needed depending on the cause and type of the hemorrhage. Surgery is often recommended to either place a metal clip at the base of an aneurysm or to remove the abnormal vessels that make up an AVM.

Some procedures are less invasive and use of a catheter that goes in through a major artery in the leg or arm. The catheter is guided to the aneurysm or AVM where it places a device, such as a coil, to prevent rupture.

**HOW CAN I LEARN MORE?**

- 1 Call **1-888-4-STROKE** (1-888-478-7653) to learn more about stroke or find local support groups, or visit [StrokeAssociation.org](http://StrokeAssociation.org).
- 2 Sign up to get Stroke Connection magazine, a free magazine for stroke survivors and caregivers at [strokeconnection.org](http://strokeconnection.org).
- 3 Connect with others sharing similar journeys with stroke by joining our Support Network at [strokeassociation.org/supportnetwork](http://strokeassociation.org/supportnetwork).

**Do you have questions for the doctor or nurse?**

Take a few minutes to write your questions for the next time you see your healthcare provider.

For example:

**What can I do to help prevent another stroke?**


**How can I control high blood pressure?**

**My Questions:**

We have many other fact sheets to help you make healthier choices to reduce your risk, manage disease or care for a loved one. Visit [strokeassociation.org/letstalkaboutstroke](http://strokeassociation.org/letstalkaboutstroke) to learn more.


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## let's talk about Risk Factors for Stroke



Knowing your risk factors for stroke is the first step in preventing a stroke. You can change or treat some risk factors, but others you can't. By having regular medical checkups and knowing your risk, you can focus on what you can change and lower your risk of stroke.


### What risk factors can I change or treat?

- **High blood pressure.** This is the single most important risk factor for stroke because it's the leading cause of stroke. Know your blood pressure and have it checked every year. Normal blood pressure is below 120/80. If you have been told that you have high blood pressure, work with your healthcare provider to reduce it.
- **Smoking.** Smoking damages blood vessels. This can lead to blockages within those blood vessels, causing a stroke. Don't smoke and avoid second-hand smoke.
- **Diabetes.** Having diabetes more than doubles your risk of stroke. Work with your doctor to manage diabetes.
- **High cholesterol.** High cholesterol increases the risk of blocked arteries. If an artery leading to the brain becomes blocked, a stroke can result.
- **Physical inactivity and obesity.** Being inactive, obese, or both, can increase your risk of heart disease and stroke.
- **Carotid or other artery disease.** The carotid arteries in your neck supply most of the blood to your brain.

A carotid artery damaged by a fatty buildup of plaque inside the artery wall may become blocked by a blood clot. This causes a stroke.

- **Transient ischemic attacks (TIAs).** Recognizing and treating TIAs can reduce the risk of a major stroke. TIAs produce stroke-like symptoms but most have no lasting effects. Know the warning signs of a TIA and seek emergency medical treatment immediately.
- **Atrial fibrillation (AFib) or other heart disease.** In AFib the heart's upper chambers quiver (like a bowl of gelatin) rather than beating in an organized, rhythmic way. This can cause the blood to pool and clot, increasing the risk of stroke. AFib increases risk of stroke five times. People with other types of heart disease have a higher risk of stroke, too.
- **Certain blood disorders.** A high red blood cell count makes clots more likely, raising the risk of stroke. Sickle cell anemia increases stroke risk because the "sickled" cells stick to blood vessel walls and may block arteries.
- **Excessive alcohol intake.** Drinking an average of more than one drink per day for women or more than two drinks a day for men can raise blood pressure. Binge drinking can lead to stroke.

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## Risk Factors for Stroke

- **Illegal drug use.** Drugs including cocaine, ecstasy, amphetamines, and heroin are associated with an increased risk of stroke.
- **Sleep apnea.** Sleep disordered breathing contributes to risk of stroke. Increasing sleep apnea severity is associated with increasing risk.

### What are the risk factors I can't control?

- **Increasing age.** Stroke affects people of all ages. But the older you are, the greater your stroke risk.
- **Gender.** Women have a higher lifetime risk of stroke than men do. Use of birth control pills and pregnancy pose special stroke risks for women.
- **Heredity and race.** People whose close blood relations have had a stroke have a higher risk of stroke. African Americans have a higher risk of death and disability from stroke than whites. This is because they have high blood pressure more often. Hispanic Americans are also at higher risk of stroke.
- **Prior stroke.** Someone who has had a stroke is at higher risk of having another one.



Age, gender, heredity and race are among the stroke risk factors that you can't control.

### HOW CAN I LEARN MORE?

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- 3 Connect with others sharing similar journeys with stroke by joining our Support Network at [strokeassociation.org/supportnetwork](http://strokeassociation.org/supportnetwork).

### Do you have questions for the doctor or nurse?

Take a few minutes to write your questions for the next time you see your healthcare provider.

For example:

- **What are my risk factors for stroke?**
- **What are the warning signs of TIAs and stroke?**

My Questions:

We have many other fact sheets to help you make healthier choices to reduce your risk, manage disease or care for a loved one. Visit [strokeassociation.org/letstalkaboutstroke](http://strokeassociation.org/letstalkaboutstroke) to learn more.

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## Lifestyle Changes To Prevent Stroke

You can do plenty to make your heart and blood vessels healthy, even if you've had a stroke. A healthy lifestyle plays a big part in decreasing your risk for disability and death from stroke and heart attack.



### How can I make my lifestyle healthier?

Here are steps to take to be healthier and reduce your risk of stroke:

- Don't smoke and avoid second-hand smoke.
- Improve your eating habits. Eat foods low in saturated fat, *trans* fat, sodium and added sugars.
- Be physically active.
- Take your medicine as directed.
- Get your blood pressure checked regularly and work with your healthcare provider to manage it if it's high.
- Reach and maintain a healthy weight.
- Decrease your stress level.
- Seek emotional support when it's needed.
- Have regular medical checkups.

### How do I stop smoking?

- The first and more important step is making a decision to quit — and commit to stick to it.

- Ask your healthcare provider for information, programs and medications that may help.
- Fight the urge to smoke by going to smoke-free facilities. Avoid staying around people who smoke.
- Keep busy doing things that make it hard to smoke, like working in the yard.
- Remind yourself that smoking causes many diseases, can harm others and is deadly.
- Ask your family and friends to support you.

### How do I change my eating habits?

- Ask your doctor, nurse or a licensed nutritionist or registered dietician for help.
- Be aware of your special needs, especially if you have high blood pressure, high cholesterol or diabetes.
- Avoid foods like fatty meats, butter and cream, which are high in saturated fat.
- Eat moderate amounts of food and cut down on saturated fat, *trans* fat, sugar and salt.
- Bake, broil, roast and boil foods instead of frying.

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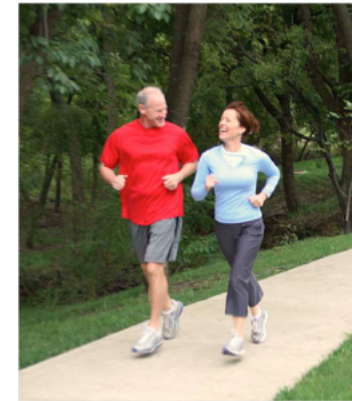


Lifestyle Changes  
To Prevent Stroke

- Read nutrition labels on packaged meals. Many are very high in sodium.
- Limit alcohol to one drink a day for women; two drinks per day for men.
- Eat more fruit, vegetables, whole-grains, dried peas and beans, pasta, fish, poultry and lean meats.

### What about physical activity?

- If you have a chronic medical condition, check with your doctor before you start.
- Start slowly and build up to at least 150 minutes of moderate physical activity (such as brisk walking) a week. Or, you can do 75 minutes of vigorous-intensity physical activity, or a combination of the two, to improve overall cardiovascular health.
- Look for even small chances to be more active. Take the stairs instead of an elevator and park farther from your destination.



If you have a chronic medical condition, check with your doctor before starting an exercise program.

### HOW CAN I LEARN MORE?

- 1 Call 1-888-4-STROKE (1-888-478-7653) to learn more about stroke or find local support groups, or visit: [StrokeAssociation.org](http://StrokeAssociation.org).
- 2 Sign up to get *Stroke Connection* magazine, a free magazine for stroke survivors and caregivers at [strokeconnection.org](http://strokeconnection.org).
- 3 Connect with others sharing similar journeys with stroke by joining our Support Network at [strokeassociation.org/supportnetwork](http://strokeassociation.org/supportnetwork).

### Do you have questions for the doctor or nurse?

Take a few minutes to write your questions for the next time you see your healthcare provider.

For example:

**What is the most important change I can make?**

**What kind of physical activity can I do safely?**

### My Questions:

We have many other fact sheets to help you make healthier choices to reduce your risk, manage disease or care for a loved one. Visit: [strokeassociation.org/letstalkaboutstroke](http://strokeassociation.org/letstalkaboutstroke) to learn more.



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### Stroke 101: Fast Facts on Stroke

- Stroke is a **brain attack**, cutting off vital blood flow and oxygen to the brain.
- In the United States, stroke is a leading cause of death, killing nearly 130,000 people each year, and a leading cause of serious, long-term adult disability.<sup>1,2</sup>
- There are an estimated **7,000,000 stroke survivors** in the U.S. over age 20.
- Approximately **795,000 strokes** will occur this year, one occurring every 40 seconds, and taking a life approximately every four minutes.<sup>2</sup>
- Stroke can happen to anyone at any time, regardless of race, sex or age.
- From 1997 to 2007, the annual stroke death rate fell approximately 34 percent, and the actual number of deaths fell by 18 percent.<sup>2</sup>
- Approximately **55,000 more women than men** have a stroke each year.
- **African Americans have almost twice the risk** of first-ever stroke compared with whites.
- Types of Stroke:
  - **Ischemic stroke** occurs when arteries are blocked by blood clots or by the gradual build-up of plaque and other fatty deposits. About 87 percent of all strokes are ischemic.
  - **Hemorrhagic stroke** occurs when a blood vessel in the brain breaks leaking blood into the brain. Hemorrhagic strokes account for thirteen percent of all strokes, yet are responsible for more than thirty percent of all stroke deaths.
- Two million brain cells die every minute during stroke, increasing risk of permanent brain damage, disability or death. Recognizing symptoms and **acting FAST** to get medical attention can save a life and limit disabilities.
- The prevalence of transient ischemic attacks (TIA – “mini strokes”) increases with age. Up to 40 percent of all people who suffer a TIA will go on to experience a stroke.
- The estimated direct and indirect cost of stroke in the United States in 2010 is \$73.7 billion.

[www.stroke.org](http://www.stroke.org)



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### Time is Brain. Call 9-1-1.

Few Americans know the signs of stroke. Learning them – and acting FAST when they occur – could save your life or the life of a loved one. Remember that stroke strikes FAST and you should too. Call 9-1-1.

Use the FAST test to recognize and respond to the signs of stroke.

<b>F = FACE</b>	Ask the person to smile. Does one side of the face droop?
<b>A = ARMS</b>	Ask the person to raise both arms. Does one arm drift downward?
<b>S = SPEECH</b>	Ask the person to repeat a simple sentence. Does the speech sound slurred or strange?
<b>T = TIME</b>	If you observe any of these signs (independently or together), call 9-1-1 immediately.

### Reducing Stroke Risk

Everyone has some stroke risk. Some risk factors are beyond your control, including being over age 55, being a male (stroke is more common in men than women at younger ages, but more women experience strokes at older ages and more women than men die from stroke), being African-American, having diabetes, and having a family history of stroke. If you have one of these risk factors, it is even more important that you learn about the lifestyle and medical changes you can make to prevent a stroke. However, everyone should do what they can to reduce their risk for stroke – learn more by reading and following the **Prevention Guidelines** below.

#### Medical stroke risk factors include:

Previous stroke, previous episode of TIA (or mini stroke), high cholesterol, high blood pressure, heart disease, atrial fibrillation and carotid artery disease. These

[www.stroke.org](http://www.stroke.org)

## Women and Stroke



One in five women in the United States will have a stroke in her lifetime. Nearly 60% of stroke deaths are in women, and stroke kills twice as many women as breast cancer. Surprised? You're not alone. Stroke is the third leading cause of death for women, yet most women do not know their risk of having a stroke.

These facts are alarming, but there is some good news: Up to 80% of strokes can be prevented. This means it is important to know your risk of having a stroke and to take action to reduce that risk.

### What Is a Stroke?

A stroke, sometimes called a brain attack, occurs when blood flow to an area of the brain is cut off. When brain cells are starved of oxygen, they die. Stroke is a medical emergency. It's important to get treatment as soon as possible. A delay in treatment increases the risk of permanent brain damage or death.

### What Puts Women at Risk of Stroke?

- **High blood pressure** is a main risk factor for stroke, yet nearly one in three women with high blood pressure does not know she has it.
- Stroke risk increases with **age**, and women live longer than men. This is why 6 in 10 people who die from stroke are women. Also, the percentage of strokes in women aged 45 or younger is increasing. Younger women may have different symptoms of stroke, such as dizziness or headache, than women age 46 and older do.
- Women have some unique risk factors for stroke. Having high blood pressure during **pregnancy** raises a woman's risk for stroke.
- Certain types of **birth control** medicines may raise stroke risk in women with high blood pressure, especially if they smoke.
- Women are twice as likely as men to experience depression and anxiety, and women often report higher stress levels than men do. These **mental health issues** all raise a person's risk for stroke.

Not all women are equally affected by stroke. African-American women are nearly twice as likely to have a stroke as white women, mainly because of having high blood pressure, being overweight, and having diabetes.

### Blanche Teal-Cruise



A smoker for 40 years, Blanche knew her habit was unhealthy. But she had no idea how it would eventually affect her health.

When Blanche almost fell down one morning after getting out of bed, she blamed her dizziness on vertigo, a condition that makes you feel dizzy or lightheaded. But when she tried to turn on the light, her arm felt like dead weight. So she rested a short while until she felt better. Then she took a shower and drove to work. She had no idea she had suffered a mild stroke.

When she arrived at work, a coworker noticed that Blanche was not walking straight. When Blanche spoke, she felt as if she had to push the words out of her mouth.

Blanche was lucky: When she got to the hospital, she was diagnosed with a transient ischemic attack, often called a "mini-stroke." Unlike major strokes, mini-strokes don't cause permanent injury to the brain. But mini-strokes can lead to a major stroke.

Blanche's mini-stroke was a wake-up call. Two weeks after her mini-stroke, Blanche quit smoking for good. Like many African-American women, Blanche also had high blood pressure. She now takes medicine to control her blood pressure and walks her dog every day to stay active. She sees her doctor regularly and works to keep her weight down.

Blanche always talks to her friends and family about how to reduce their chances of having a stroke and how to recognize if someone is having a stroke. She has learned so much about how to prevent stroke, and she likes to spread the word to others about the importance of going to the doctor and quitting smoking.

### How Can I Prevent Stroke?

Most strokes can be prevented by keeping medical conditions under control and making lifestyle changes. A good place to start is to know your **ABCS of heart health**:

- A Aspirin:** Aspirin may help reduce your risk for stroke. But you should check with your doctor before taking aspirin because it can make some types of stroke worse. Before taking aspirin, talk with your doctor about whether aspirin is right for you.
- B Blood Pressure:** Control your blood pressure.
- C Cholesterol:** Manage your cholesterol.
- S Smoking:** Quit smoking or don't start.

Make lifestyle changes:

- **Eat healthy and stay active.** Choose healthy foods most of the time, including foods with less salt, or sodium, to lower your blood pressure, and get regular exercise. Being overweight or obese raises your risk of stroke.
- **Talk to your doctor about your chances of having a stroke**, including your age and whether anyone in your family has had a stroke.
- **Get other health conditions under control**, such as diabetes or heart disease.

### What Is CDC Doing About Stroke?

CDC and its partners are leading national initiatives and programs to reduce the death and disability caused by stroke and to help women live longer, healthier lives.

- CDC's [Division for Heart Disease and Stroke Prevention](#) (DHDSP) provides resources to all 50 states to address heart disease and stroke.
- DHDSP supports the [WISEWOMAN](#) program that provides low-income, under-insured or uninsured women with chronic disease risk factor screening, lifestyle programs, and referral services in an effort to prevent heart disease and strokes.
- The [Paul Coverdell National Acute Stroke Program](#) funds states to measure, track, and improve the quality of care for stroke patients. The program works to reduce death and disabilities from stroke.
- The [Million Hearts](#)® initiative, which is co-led by CDC and the Centers for Medicare & Medicaid Services, works with other federal agencies and private sector partners to raise awareness about stroke prevention. Million Hearts® aims to prevent 1 million heart attacks and strokes by 2017.

### If Stroke Happens, Act F.A.S.T.

Knowing your risk factors is only half the battle. Strokes come on suddenly and should be treated as medical emergencies. If you think you or someone else may be having a stroke, act F.A.S.T.:



**F—Face:**  
Ask the person to smile. Does one side of the face droop?



**A—Arms:**  
Ask the person to raise both arms. Does one arm drift downward?



**S—Speech:**  
Ask the person to repeat a simple phrase. Is the speech slurred or strange?



**T—Time:**  
If you see any of these signs, call 9-1-1 right away.

Calling an ambulance is critical because emergency medical technicians, or EMTs, can take you to a hospital that can treat stroke patients, and in some cases they can begin life-saving treatment on the way to the emergency room. Some treatments for stroke work only if given within the first 3 hours after symptoms start.

National Center for Chronic Disease Prevention and Health Promotion  
Division for Heart Disease and Stroke Prevention



Learn more by visiting [www.cdc.gov/stroke](http://www.cdc.gov/stroke)

## Men and Stroke



Stroke is the fifth leading cause of death in men, killing almost the same number of men each year as prostate cancer and Alzheimer's disease combined. Stroke is a leading cause of long-term disability among American men. In addition, men have strokes at younger ages than women.

These facts are alarming, but there is some good news: Up to 80% of strokes can be prevented. This means it is important to know your risk of having a stroke and taking action to reduce that risk.

### What Is a Stroke?

A stroke, sometimes called a brain attack, occurs when blood flow to an area of the brain is cut off. When brain cells are starved of oxygen, they die. Stroke is a medical emergency. It's important to get treatment as soon as possible. A delay in treatment increases the risk of permanent brain damage or death.

### What Puts Men at Risk of Stroke?

- **High blood pressure** is a main risk factor for stroke, yet nearly one in three men with high blood pressure does not know he has it.
- Smoking damages blood vessels, which can cause a stroke. Men are more likely to be **smokers** than women.
- Being **overweight or obese** increases your risk of stroke. Almost 3 in 4 American men are in weight ranges that increase their risk for stroke.
- More men than women have been diagnosed with **diabetes**, which increases your risk of stroke because it can cause disease of blood vessels in the brain.
- Men are more likely than women to drink too much **alcohol**, increasing the risk for stroke.
- **Being inactive** can increase the risk of stroke. Only 1 in 4 men gets enough physical activity, even though exercising only 30 minutes a day can decrease the risk of stroke.

### Charles Stanley

Linda Stanley awoke to a loud noise in her home but was puzzled because she knew her husband Charles should have been at work. She searched the house and called his name, but she didn't hear any response. When she entered the living room, she found Charles lying on the floor. His work truck was still idling in the driveway. Linda wasted no time calling 9-1-1.

It turned out that Charles, who is African American, had a stroke even though he was only 52 years old. African-American men are at a greater risk of stroke than any other group of men and have strokes at younger ages.

"At first, I couldn't do anything. People on TV sounded like they were speaking a strange language," Charles remembers. "I got so frustrated!"

Charles spent 3 days in the intensive care unit and 4 weeks in a rehabilitation center. He worked with therapists to learn how to read, write, and walk again. Charles realized that he had to make some changes in his lifestyle to avoid another stroke. He lost nearly 100 pounds and worked with his health care providers to get his blood pressure under control. He's also changed his eating habits and does an hour of cardio exercise every day.

Charles and Linda have advice for others at risk for stroke: "Take care of yourself. Get moving, lose weight, stop smoking—these steps will help people avoid a stroke," Charles recommends. His wife adds, "Know the signs of stroke. Be ready to call 9-1-1 if you think someone's having a stroke."

### How Can I Prevent Stroke?

Most strokes can be prevented by keeping medical conditions under control and making lifestyle changes. A good place to start is to know your **ABCS of heart health**:

- A Aspirin:** Aspirin may help reduce your risk for stroke. But you should check with your doctor before taking aspirin because it can make some types of stroke worse. Before taking aspirin, talk with your doctor about whether aspirin is right for you.
- B Blood Pressure:** Control your blood pressure.
- C Cholesterol:** Manage your cholesterol.
- S Smoking:** Quit smoking or don't start.

Make lifestyle changes:

- **Eat healthy and stay active.** Choose healthy foods most of the time, including foods with less salt, or sodium, to lower your blood pressure, and get regular exercise. Being overweight or obese raises your risk of stroke.
- **Talk to your doctor about your risk factors for stroke**, including your age and whether anyone in your family has had a stroke.
- **Get other health conditions under control**, such as diabetes or heart disease.

### What Is CDC Doing About Stroke?

CDC and its partners are leading national initiatives and programs to reduce the death and disability caused by stroke and to help men live longer, healthier lives.

- CDC's [Division for Heart Disease and Stroke Prevention](#) provides resources to all 50 states to address heart disease and stroke.
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- The [Million Hearts®](#) initiative, which is co-led by CDC and the Centers for Medicare & Medicaid Services, works with other federal agencies and private sector partners to raise awareness about stroke prevention. Million Hearts® aims to prevent 1 million heart attacks and strokes by 2017.

### If Stroke Happens, Act F.A.S.T.

Knowing your chances of having a stroke is only half the battle. Strokes come on suddenly and should be treated as medical emergencies. If you think you or someone else may be having a stroke, act F.A.S.T.:



#### F—Face:

Ask the person to smile. Does one side of the face droop?



#### A—Arms:

Ask the person to raise both arms. Does one arm drift downward?



#### S—Speech:

Ask the person to repeat a simple phrase. Is the speech slurred or strange?



#### T—Time:

If you see any of these signs, call 9-1-1 right away.

Calling an ambulance is critical because emergency medical technicians, or EMTs, can take you to a hospital that can treat stroke patients, and in some cases they can begin life-saving treatment on the way to the emergency room. Some treatments for stroke work only if given within the first 3 hours after symptoms start.





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medical risk factors can be controlled and managed even if you have already had issues with any of them in the past. Talk with your doctor about what will work best for you.

**Lifestyle stroke risk factors include:**

Smoking, being overweight and drinking too much alcohol. You can control these lifestyle risk factors by quitting smoking, exercising regularly, watching what and how much you eat and limiting alcohol consumption.

**Public Stroke Prevention Guidelines**

**1. Know your blood pressure.**

If it is elevated, work with your doctor to keep it under control. High blood pressure is a leading cause of stroke. Have your blood pressure checked at least once each year—more often if you have a history of high blood pressure.

**2. Find out if you have atrial fibrillation (AF).**

If you have AF, work with your doctor to manage it. Atrial fibrillation can cause blood to collect in the chambers of your heart. This blood can form clots and cause a stroke. Your doctor can detect AF by carefully checking your pulse.

**3. If you smoke, stop.**

Smoking doubles the risk for stroke. If you stop smoking today, your risk for stroke will begin to decrease.

**4. If you drink alcohol, do so in moderation.**

Drinking a glass of wine or beer or one drink each day may lower your risk for stroke (provided that there is no other medical reason you should avoid alcohol). Remember that alcohol is a drug - it can interact with other drugs you are taking, and alcohol is harmful if taken in large doses. If you don't drink, don't start.

**5. Know your cholesterol number.**

If it is high, work with your doctor to control it. Lowering your cholesterol may reduce your stroke risk. High cholesterol can also indirectly increase stroke risk by putting you at greater risk of heart disease - an important stroke risk factor. Often times, high cholesterol can be controlled with diet and exercise; some individuals may require medication.

[www.stroke.org](http://www.stroke.org)



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**6. Control your diabetes.**

If you are diabetic, follow your doctor's recommendations carefully because diabetes puts you at an increased risk for stroke. Your doctor can prescribe a nutrition program, lifestyle changes and medicine that can help control your diabetes.

**7. Include exercise in the activities you enjoy in your daily routine.**

A brisk walk, swim or other exercise activity for as little as 30 minutes a day can improve your health in many ways, and may reduce your risk for stroke.

**8. Enjoy a lower sodium (salt), lower fat diet.**

By cutting down on sodium and fat in your diet, you may be able to lower your blood pressure and, most importantly, lower your risk for stroke.

**9. Ask your doctor if you have circulation problems.**

If so, work with your doctor to control them. Fatty deposits can block arteries that carry blood from your heart to your brain. Sickle cell disease, severe anemia, or other diseases can cause stroke if left untreated.

**10. Act FAST.**

If you have any stroke symptoms, seek immediate medical attention.

<sup>1</sup> Miniño, Arialdi, Jiaquan Xu, and Kenneth Kochanek. *Deaths: Preliminary Data for 2008*. National Vital Statistics Reports (2010) 59.2.

<sup>2</sup> American Heart Association. *Heart Disease and Stroke Statistics – 2011 Update*. Dallas, Texas: American Heart Association; 2010.

[www.stroke.org](http://www.stroke.org)



## Be Smoke Free: Smoking and Stroke Risk

### **FACT: Smoking puts you at risk for having a stroke.**

Stroke is the fifth leading cause of death and a leading cause of adult disability in the United States. When you stop smoking, you greatly reduce your chances of having a stroke.

Smoking reduces the amount of oxygen in the blood, causing the heart to work harder and allowing blood clots to form more easily. Smoking also increases the amount of build-up in the arteries, which may block the flow of blood to the brain, causing a stroke.

### **Common concerns about quitting**

*"I'll gain weight if I quit smoking."*

Weight gain varies from person to person. The average person gains less than 10 pounds. Exercise and a low-fat diet can help. Eat plenty of fruits and vegetables, whole grain cereals and pasta. Low-sugar candy may also help. Try to get enough sleep. Ask your doctor how to quit smoking while maintaining your weight.

*"What do I do when I get the urge to smoke?"*



When possible, stay away from places where others might be smoking. Ask others not to smoke around you. When you do feel the urge to smoke, distract yourself and stay busy. If you can make it three minutes, the urge probably will go away. You can also ask your doctor about prescription medications or nicotine replacement therapy, including over-the-counter patches and gum.

*"Smoking relaxes me. I get too nervous and anxious if I don't smoke."*

First, try to take it easy. It is best to warn those around you that you have quit smoking. Try going for a walk if you get tense. Exercise can help you relax.

*"I blew it. What do I do now?"*

Smoking cigarettes again does not mean that you have failed. You have already had some success. You got through a number of minutes, days or months without smoking. Don't let relapses serve as excuses to start smoking again. You are an ex-smoker and can continue to be one.

*"I've tried to quit smoking before. What makes this time different?"*

You can choose to be a non-smoker and be successful. It is important enough to your health to make another attempt. Set a goal for yourself. Think about why you smoke and different ways to handle those reasons without smoking. Ask your doctor or pharmacist for information about local support groups. There are over 46.5 million ex-smokers in the United States. You can be one of them.

### **Tips to quit smoking:**

- Set a Quit Date. Mark your calendars at home and at work.
- Tell your family, friends and co-workers that you are going to quit. Ask for their support.
- Ask your doctor about nicotine replacement therapy or medication that can help control your urges to smoke.

- Throw away all of your cigarettes, ashtrays, lighters and matches before your Quit Date.
- Reward yourself for doing well. Buy something nice for yourself with the money you have saved on cigarettes.

### **Additional Resources:**

American Cancer Society  
(800) 227-2345  
[www.cancer.org](http://www.cancer.org)

American Lung Association  
(800) LUNG USA (586-4872)  
[www.lungusa.org](http://www.lungusa.org)

National Cancer Institute  
(800) 4-CANCER (422-6237)  
[www.cancer.gov](http://www.cancer.gov)

For more information about ways to reduce your risk of stroke, visit National Stroke Association.  
[www.stroke.org](http://www.stroke.org)

Note: This fact sheet is compiled from general, publicly available information and should not be considered recommended treatment for any particular individual. You should consult your provider about any personal medical concerns.

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## Healthy Eating Fact Sheet

Eating healthy plays a big role in lowering the risk of stroke and many other health conditions.

### What is healthy eating?

Healthy eating means eating a diet that is high in nutrients and low in fat, sugars, and sodium. According to the *Dietary Guidelines for Americans 2010*, a healthy eating plan includes:

- A focus on fruits, vegetables, and whole grains
- Fat-free or low-fat milk and milk products
- Lean meats, poultry, fish, beans, eggs, and nuts
- Foods low in saturated fats and *trans* fats
- Foods low in fat, salt (sodium), and added sugars

### What are the benefits of healthy eating?

Healthy eating is one of the best things you can do to prevent and control many health problems. And, a healthy diet can help you maintain a healthy weight, feel your best, have more energy, and handle stress better.

On the other hand, unhealthy eating can be harmful to your arteries, blood pressure, and glucose level. It can

also lead to excess weight, putting a strain on your body.



### What is the best way to start eating healthy?

Eating healthy does not have to be scary or complex, and healthy foods do not have to be bland and boring. These guidelines can help you start enjoying healthy, food, feeling better, and improving your health.

**Fruits and vegetables** – These are packed with key vitamins and nutrients, such as calcium and fiber. Aim to eat at least five servings of fruits and vegetables every day.

**Lean protein** – When you pledge to eat healthy, it's okay to enjoy meat. The important thing is to choose lean

meat. This includes boneless, skinless chicken breasts and turkey cutlets, and leaner cuts of ground beef. Broil grill, roast, poach, or boil meat instead of frying. Also try to avoid sauces and gravies that are high in fat and sugar.

### Seek low-fat dairy options –

While many dairy products are rich in protein and calcium, they are also high in fat, which can cause cholesterol to build up in arteries increasing the risk for many major health problems.

**Drink in moderation** – Drinking too much alcohol increases blood pressure and the risk of stroke. Aim to drink no more than two drinks a day for men and one drink a day for women.

**Watch your calories** – Part of eating healthy means having a healthy weight, which includes not eating more calories than you burn off. Calorie intake is based on gender, age, and activity level.

**Plan** – Vending machines and fast food can be tempting when you're rushed or stressed. To eat healthy, plan menus ahead of time and keep healthy snacks on hand.

**Change your choices** – Simple changes in how you prepare and ask

for food can add up to big changes. Choose grilled fish instead of fried. At a restaurant, choose vegetables as a side instead of French fries.

**Stay positive** – It can take a long time to begin new habits in the way you eat and drink, so go easy on yourself as you're starting out. Remember that every small change you make in the way you eat adds up to big differences in your overall health.

### For more information:

National Heart, Lung and Blood Institute – Cholesterol Education Project  
1-800-575-WELL (575-9355)  
[www.nhlbi.nih.gov/chd](http://www.nhlbi.nih.gov/chd)

National Stroke Association  
1-800-STROKES (787-6537)  
[www.stroke.org](http://www.stroke.org)

Note: This fact sheet is compiled from general, publicly available information and should not be considered recommended treatment for any particular individual. You should consult your provider about any personal medical concerns.

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## Physical Activity Fact Sheet

### Physical Activity Fact sheet

Physical activity helps improve your health and reduce your risk of stroke. Regular physical activity also helps you maintain a healthy weight, feel better, and sleep better.

### What is physical activity?

Being physically active is as simple as gardening, walking, or house cleaning.

The Department of Health and Human Services recommends:

- At least 150 minutes a week of moderate aerobic activity, 75 minutes a week of vigorous aerobic activity, or a combination of both.
- Strength training, which can help increase muscle mass or maintain it.
- Breaking up exercise into small chunks of time. Aim for 150 minutes a week.

### What are the benefits of physical activity?

Regular physical exercise helps you:

- Lose or control your weight
- Reduce your risk for many diseases and cancers
- Strengthen your bones and muscles
- Improve your mental health and mood
- Improve your everyday functioning and prevent falls
- Live longer

### What are ways to be physically active?

Many people start exercise programs at a health club, gym, or recreation center where they can get access to equipment and support.



There are many things you can do every day at home to increase your activity. For example, you can:

- ✓ Do yard work
- ✓ Go for a short walk.
- ✓ Stand and pace while talking on the phone
- ✓ Do stretches, sit-ups, and push-ups while watching TV
- ✓ Dance to music as you're cleaning the house

All these activities use energy to get your body moving and improve your health.

### What is the best way to get started?

First check with your healthcare provider to make sure you are cleared for exercise. Your doctor can help you determine your fitness goals and create a plan for you. From there, our "Getting Started Checklist" and these tips can help make regular physical activity a part of your life.

**Start slowly** – Many people try to do too much too soon, and get injured or disillusioned. Instead, do 10- to 15-minute chunks of activity, several times a day.

**Make exercise part of your lifestyle** – Schedule workouts on your calendar, have walking shoes on hand, and keep your gym bag in your car. You can also do everyday activities like parking far from an entrance and taking the stairs.

**Reward yourself** – It's important to reward yourself when you reach a goal, such as losing a pound. The reward should be something not food related.

**Pass the time** – Listening to music or books on tape or watching television while you exercise can often help keep you focused and motivated.

**Remember to strength train** – Aim to add two to three strength training sessions a week to your workout. Building muscle can help develop strong bones, burn calories, improve balance, and reduce the signs and symptoms of many chronic conditions. You can strength train by lifting weights, using weight machines, or doing pushups etc.

**Workout with others** – Meeting a friend for a walk or joining a fitness class increases your accountability to ensure that you show up to exercise. And it is more fun too.

**Count your steps** – Investing in a fitness tracking device can help you monitor your daily activity.

Start off with a goal to walk 5,000 steps a day and gradually increase your distance.



For more information about ways to reduce your risk of stroke, visit National Stroke Association.  
[www.stroke.org](http://www.stroke.org)

Note: This fact sheet is compiled from general, publicly available information and should not be considered recommended treatment for any particular individual. You should consult your provider about any personal medical concerns.

All publications are reviewed by National Stroke Association's Publications Committee.  
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National Stroke Association. (2018b). Fact Sheets. Retrieved June 27, 2018, from <http://www.stroke.org/stroke-resources/resource-library/fact-sheets>



Appendix I

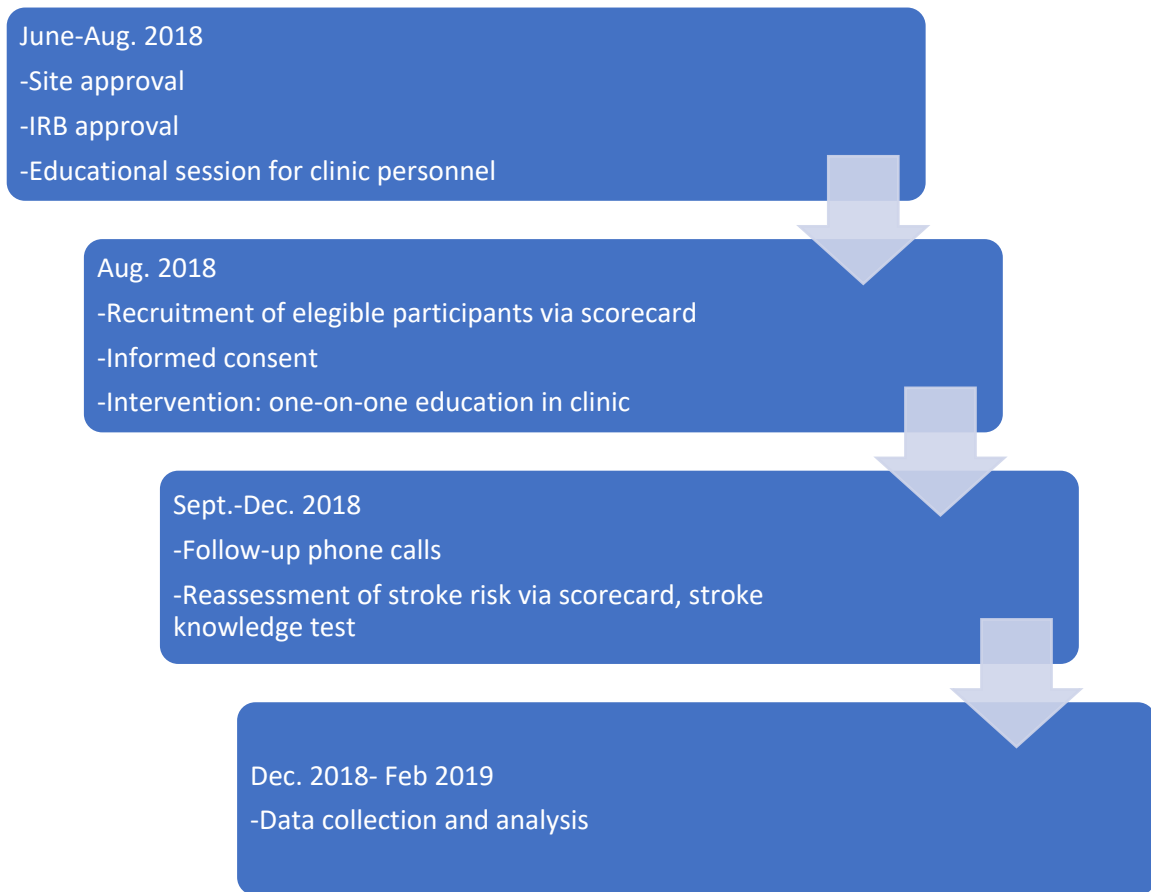
# September 2018

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Weight _____ Cigarettes _____ 30+min exercise: Yes No
2 Weight _____ Cigarettes _____ 30+min exercise: Yes No	3 Weight _____ Cigarettes _____ 30+min exercise: Yes No	4 Weight _____ Cigarettes _____ 30+min exercise: Yes No	5 Weight _____ Cigarettes _____ 30+min exercise: Yes No	6 Weight _____ Cigarettes _____ 30+min exercise: Yes No	7 Weight _____ Cigarettes _____ 30+min exercise: Yes No	8 Weight _____ Cigarettes _____ 30+min exercise: Yes No
9 Weight _____ Cigarettes _____ 30+min exercise: Yes No	10 Weight _____ Cigarettes _____ 30+min exercise: Yes No	11 Weight _____ Cigarettes _____ 30+min exercise: Yes No	12 Weight _____ Cigarettes _____ 30+min exercise: Yes No	13 Weight _____ Cigarettes _____ 30+min exercise: Yes No	14 Weight _____ Cigarettes _____ 30+min exercise: Yes No	15 Weight _____ Cigarettes _____ 30+min exercise: Yes No
16 Weight _____ Cigarettes _____ 30+min exercise: Yes No	17 Weight _____ Cigarettes _____ 30+min exercise: Yes No	18 Weight _____ Cigarettes _____ 30+min exercise: Yes No	19 Weight _____ Cigarettes _____ 30+min exercise: Yes No	20 Weight _____ Cigarettes _____ 30+min exercise: Yes No	21 Weight _____ Cigarettes _____ 30+min exercise: Yes No	22 Weight _____ Cigarettes _____ 30+min exercise: Yes No
23 Weight _____ Cigarettes _____ 30+min exercise: Yes No	24 Weight _____ Cigarettes _____ 30+min exercise: Yes No	25 Weight _____ Cigarettes _____ 30+min exercise: Yes No	26 Weight _____ Cigarettes _____ 30+min exercise: Yes No	27 Weight _____ Cigarettes _____ 30+min exercise: Yes No	28 Weight _____ Cigarettes _____ 30+min exercise: Yes No	29 Weight _____ Cigarettes _____ 30+min exercise: Yes No
30 Weight _____ Cigarettes _____ 30+min exercise: Yes No						

Note: weigh self once a week

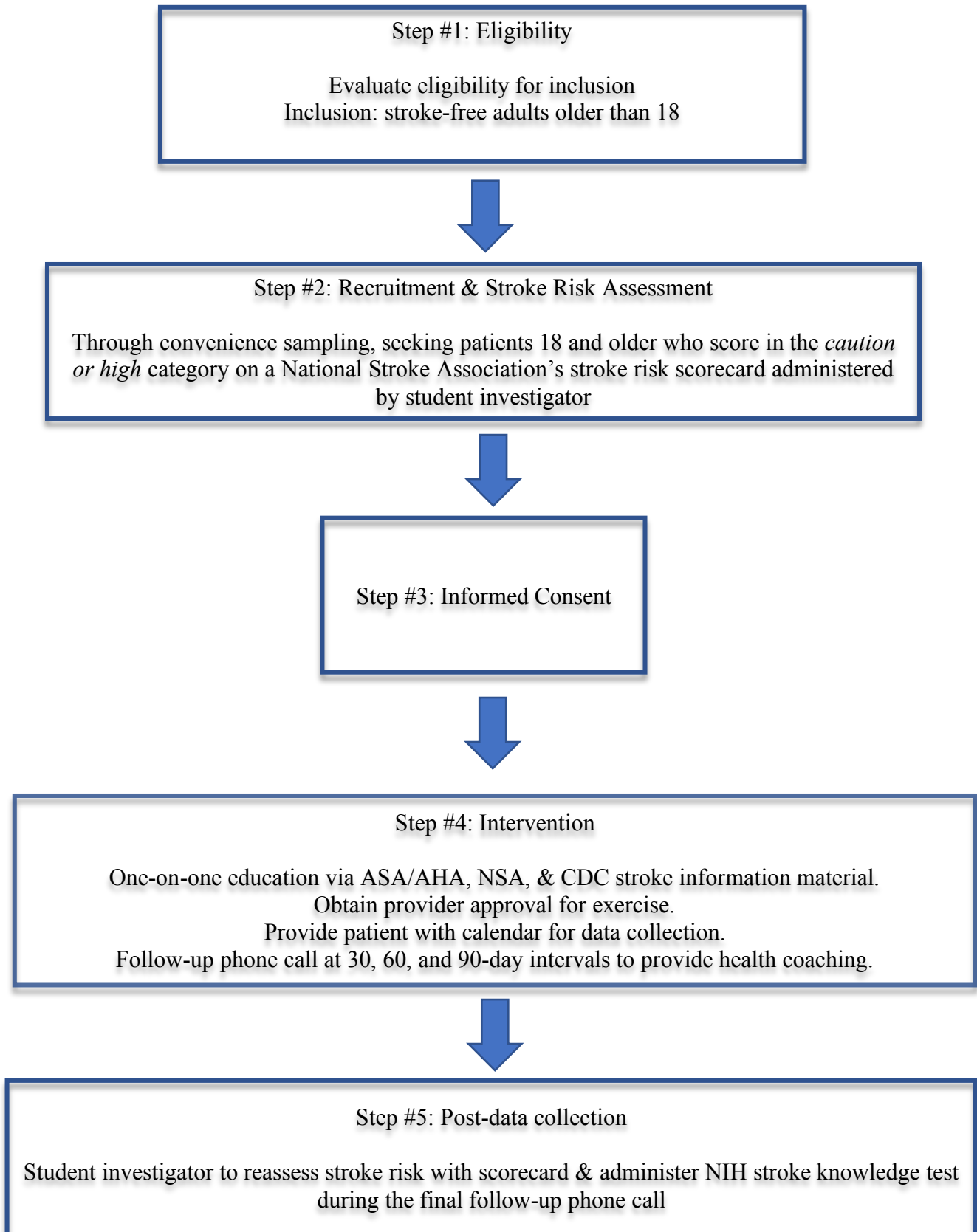
Appendix J

Project Timeline Flow




## Appendix K

## Intervention Participant Flow Diagram




## Appendix L



## Stroke Risk Scorecard

Each box that applies to you equals 1 point. Total your score at the bottom of each column and compare with the stroke risk levels on the back.

RISK FACTOR	HIGH RISK	CAUTION	LOW RISK
Blood Pressure	<input type="checkbox"/> >140/90 or unknown	<input type="checkbox"/> 120-139/80-89	<input type="checkbox"/> <120/80
Atrial Fibrillation	<input type="checkbox"/> Irregular heartbeat	<input type="checkbox"/> I don't know	<input type="checkbox"/> Regular heartbeat
Smoking	<input type="checkbox"/> Smoker	<input type="checkbox"/> Trying to quit	<input type="checkbox"/> Nonsmoker
Cholesterol	<input type="checkbox"/> >240 or unknown	<input type="checkbox"/> 200-239	<input type="checkbox"/> <200
Diabetes	<input type="checkbox"/> Yes	<input type="checkbox"/> Borderline	<input type="checkbox"/> No
Exercise	<input type="checkbox"/> Couch potato	<input type="checkbox"/> Some exercise	<input type="checkbox"/> Regular exercise
Diet	<input type="checkbox"/> Overweight	<input type="checkbox"/> Slightly overweight	<input type="checkbox"/> Healthy weight
Stroke in Family	<input type="checkbox"/> Yes	<input type="checkbox"/> Not sure	<input type="checkbox"/> No
TOTAL SCORE	<input type="checkbox"/> High Risk	<input type="checkbox"/> Caution	<input type="checkbox"/> Low Risk



## Risk Scorecard Results

**High Risk ≥3:** Ask about stroke prevention right away.

**Caution 4-6:** A good start. Work on reducing risk.

**Low Risk 6-8:** You're doing very well at controlling stroke risk!

**Ask your healthcare professional how to reduce your risk of stroke.**

**To reduce your risk:**

1. Know your blood pressure.
2. Find out whether you have atrial fibrillation.
3. If you smoke, stop.
4. Find out if you have high cholesterol.
5. If diabetic, follow recommendations to control your diabetes.
6. Include exercise in your daily routine.
7. Enjoy a lower-sodium (salt), lower-fat diet.

**Act FAST and CALL 9-1-1 IMMEDIATELY at any sign of a stroke:**

**F** **FACE:** Ask the person to smile. Does one side of the face droop?

**A** **ARMS:** Ask the person to raise both arms. Does one arm drift downward?

**S** **SPEECH:** Ask the person to repeat a simple phrase. Is their speech slurred or strange?

**T** **TIME:** If you observe any of these signs, call 9-1-1 immediately.

**1-800-STROKES (787-6537) • www.stroke.org**

National Stroke Association. (2018a). Stroke Risk Scorecard. Retrieved from <http://www.stroke.org/stroke-resources/resource-library/stroke-risk-scorecard>

## Appendix M

## Stroke Knowledge Test

1. Women are more likely to die from breast cancer than stroke.
  - a. True
  - b. False
2. Stroke is a leading cause of death in the country and causes more serious long-term disabilities than any other disease.
  - a. True
  - b. False
3. A stroke can occur in your brain or in your heart.
  - a. True
  - b. False
4. Which of the following are signs of stroke?
  - a. Sudden confusion, trouble speaking or understanding speech
  - b. Sudden, severe headache with no known cause
  - c. Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
  - d. Sudden trouble seeing in one or both eyes
  - e. Sudden trouble walking, dizziness, loss of balance or coordination
5. Stroke symptoms that last only a short time and then disappear (also called transient ischemic attack or TIA) are:
  - a. Nothing to worry about unless they reoccur.

- b. An indication that you could have a major stroke. You should be medically evaluated immediately.
6. If you believe someone is having a stroke what should you do?
- a. Drive them immediately to their doctor's office.
  - b. Drive them immediately to the nearest emergency room.
  - c. Call 9-1-1 immediately.
7. Which of the following are risk factors for stroke?
- a. High blood pressure
  - b. Heart disease
  - c. Smoking
  - d. High cholesterol
  - e. Diabetes

National Institutes of Health. (n.d.). Test Your Stroke Knowledge. Retrieved from

<https://stroke.nih.gov/about/quiz.htm>



1	FinalCigarettes	FinalCholesterol	FinalExercise	FinalFamHistory	FinalScorecardResults	StrokeKnowledgeTest
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## Appendix O

## Statistical Analysis Table Template

	Pre-intervention (Baseline)	Post-intervention (Final)	Test statistics and significance
Age			
Gender			
Race			
Educational Level			
Insurance			
Systolic Blood Pressure			
Diastolic Blood Pressure			
Weight			
BMI			
Atrial Fibrillation			
Cigarettes			
Cholesterol			
Diabetes			
Exercise			
Family History			
Scorecard Results			
Stroke Knowledge Test			

## Appendix P

## Demographic Data

Variables	(%)
Age	
50-59	30%
60-69	40%
70-79	20%
80+	10%
Sex	
Female	100%
Male	0%
Ethnicity	
Caucasian	100%
African	0%
Asian	0%
Hispanic	0%
Education	
High school	40%
Some college	20%
Associates	10%
Bachelors	20%
Masters	10%
Insurance	
Self-pay	10%
Private	10%
Medicaid	10%
Medicare	30%
Private + Medicare	40%
Total	10 participants

## Appendix Q

## Data Collection

Participant	Baseline Results								
	BP	Wt (lb), BMI	A Fib	Cigarettes	Cholesterol	Diabetes	Exercise	Family Hx	Risk Score
1.	145/82	213, 38	No	No	285	No	Walks 15min 7x/w	No	High
2.	180/95	188, 32	No	No	178	No	None	Yes	High
3.	130/90	207, 34	No	Yes, 1ppd	212	No	None	No	High
4.	125/58	151, 28	No	No	289	No	None	No	Caution
5.	152/90	199, 39	No	No	168	Yes	None	Yes	High
6.	140/72	191, 37	No	No	136	Yes	None	No	High
7.	110/70	212, 38	No	No	167	No	Treadmill 15min 3x/w	Yes	High
8.	122/68	120, 24	No	Yes, 1ppd	265	Yes	None	Yes	High
9.	138/80	233, 46	No	No	126	Yes	Walks 30min 4x/w	Yes	High
10.	122/66	169, 38	No	Yes, <1/2ppd	181	Yes	None	Yes	High

Participant	Final Results								
	BP	Wt (lb), BMI	A Fib	Cigarettes	Cholesterol	Diabetes	Exercise	Family Hx	Risk Score
1.	119/78	181, 32	No	No	242	No	None	No	Low
2.	118/80	192, 33	No	No	183	No	Walks 2 miles 7x/w	Yes	Low
3.	142/92	215, 36	No	Yes, 1ppd	254	No	Walks 30min 3x/w	No	High
4.	130/72	158, 29	No	No	N/A	No	Walks 30min 3x/w	No	Low
5.	186/86	205, 40	No	No	N/A	Yes	Walks 15-30min 2x/w	Yes	High
6.	134/70	189, 37	No	No	141	Yes	None	No	High
7.	124/76	220, 39	No	No	N/A	No	None	Yes	High
8.	124/68	117, 23	No	Yes, 1-1.5ppd	214	Yes	None	Yes	High
9.	118/60	237, 46	No	No	141	Yes	Walks 30min 4x/w	Yes	High
10.	120/68	170, 38	No	No	N/A	Yes	None	Yes	High

## Appendix R

## Results

	Baseline Results	Final Results
<b>Scorecard Results</b>		
High Risk	90%	70%
Caution Risk	10%	0%
Low Risk	0%	30%
Total	10	10
<b>Smoking Status</b>		
Yes	30%	20%
No	70%	80%
Total	10	10
<b>BMI Results</b>		
Normal weight (18.5-24.9)	10%	10%
Overweight (25-29.9)	10%	10%
Obese (30+)	80%	80%
Total	10	10
<b>Physical Exercise Results</b>		
No exercise	70%	50%
15-30 minutes 3+ days of the week	30%	50%
Total	10	10

## Stroke Knowledge Test

Test Score	Frequency
100%	4
86%	4
71%	2
Total	10

## Appendix S

## Proposal Approval Letter



August 21, 2018

UMKC IRB  
Primary Project Site IRB  
UMKC DNP Student

UMKC or Primary Project Site IRB, and DNP Student

This letter serves to provide documentation regarding Kalie Leinenbach's Doctor of Nursing Practice (DNP) Project proposal. Ms. Leinenbach obtained approval for her project proposal, *Stroke Education to Reduce Adult Stroke Risk*, from the School of Nursing and Health Studies DNP faculty on August 21, 2018.

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

Sincerely,

A handwritten signature in cursive script that reads "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](mailto:barberch@umkc.edu)

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