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Primary Stroke Prevention: 3-hydroxy-3-methyl-glutaryl-Coenzyme A (HMG-CoA) Reductase Inhibitor (statin) Use in the Diabetic Patient

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Dedication

This capstone work is dedicated to my wonderful husband, Bruce Hatcher, who has been a constant source of support, love and encouragement during the challenges of graduate school and life. I am truly thankful for having you in my life. You make me complete and I could not have achieved this without you. This work is also dedicated to my parents, Leroy and Valerie Strange, who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve. Lastly, to my younger sister Laura, you continually make me so proud in all that you do and I hope that I can do the same.

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Introduction

Cerebrovascular disease is the fourth leading cause of death in the United States and the most common cause of adult disability (National Institute of Neurological Disorders and Stroke, 2013). The annual costs of ischemic cerebrovascular disease in the United States exceed $73.7 billion (American Stroke Association, 2010). By 2020, stroke will become the leading cause of death and disability worldwide (World Health Organization, 2010). Unlike other organs of the body, the brain has limited energy reserves and any disruption in blood supply is critical and results in a cascade of events ultimately leading to loss of brain tissue and function. Persons sustaining a stroke may experience loss of movement and/or ability to perceive sensation, inability to speak or understand, and/or loss of vision. Death occurs in approximately 30% of stroke victims (ASA, 2010). It has been estimated that up to 80% of strokes are preventable by controlling risk factors, such as hypertension, tobacco abuse, dyslipidemia, and glucose intolerance (NINDS, 2013). Risk factors, refractory to stroke risk reduction include age, genetics, race and gender.

The benefits of primary care based interventions of lifestyle modification, education, pharmacological treatment, counseling, and effective community education programs; are vital to increase public awareness of stroke and decrease incidence (American Heart Association/American Stroke Association, 2011; Yoon, & Byles 2002). The vast majority of these events can potentially be prevented if translation of evidence to healthcare professionals and the public at large denoting specific risk factors and interventions are successful. However, the incidence of

stroke remains high despite evidence-based advances in prevention and treatment. Men have a higher incidence of stroke in almost every age-specific grouping when compared to women. The exceptions are ages 35 to 44 and >85 years of age. Yet, despite the overall higher incidence of strokes in the male population, women have a higher rate of death from stroke (ASA/AHA, 2011). Important risk factors for women under the age of 55 include: migraines, birth control pills, hormone replacement therapy, autoimmune diseases (e.g., diabetes and lupus), and clotting disorders (AHA/ASA, 2011). The inability to disseminate critical information about stroke awareness in a form that is accessible, understood, internalized and results in improved health care habits limits the ability of evidence-based practice to affect stroke occurrence and treatment.

Analysis of the American Heart Association/American Stroke Association 2011 Primary Stroke Prevention Guidelines and the American Heart Association/American Stroke Association 2014 Guidelines for the Prevention of Stroke in Women have shown that a knowledge gap exists about what is known about stroke and the public's awareness. Women appear to be more knowledgeable regarding stroke symptoms and interventions, but have been found to have a longer wait time to seek emergent care than their male counterparts (AHA/ASA, 2014). The AHA/ASA (2014) has also defined an even lower knowledge deficit in the minority women population.

Despite advances in knowledge and management of modifiable risk factors and acute therapeutic intervention stroke, awareness remains limited, not only in terms of stroke symptoms and stroke-risk factors, but also in terms of appropriate

response when symptoms occur (Miller & Spilker, 2003; Das, Mondal, Dutta, Mukherjee & Mukherjee, 2007; Reeves, Hogan & Rafferty, 2002; Pancioli, Braderick & Kothari, 1998). The purpose of this capstone project is to explore strategies for stroke prevention. A review of the literature on the effect of educational interventions on stroke awareness is the focus of the first manuscript. The second manuscript will analyze the 2014 Guidelines for the Prevention of Stroke in Women: A Statement for Healthcare Professionals from the American Heart Association/American Stroke Association. One of the many independent and modifiable risk factors for stroke is diabetes (Hewitt, Castilla Guerra, Fernández-Moreno, & Sierra, 2012). Diabetes affects over 25 million people and is the 7th leading cause of death in the United States (Centers for Disease Control, 2011). A diabetic individual's risk for stroke and death from stroke are 2 to 4 times higher than those without diabetes (AHA/ASA, 2011; CDC, 2012; Hewitt et al., 2012). Maintaining strict glycemic control is not the only source of intervention for reducing stroke risk. Based on data from multiple randomized clinical trials the AHA/ASA guidelines recommend diabetic patients receive an HMG-CoA reductase inhibitor (statin) even in the presence of normolipidemia and cholesterol, to decrease primary stroke incidence (AHA/ASA, 2011; Heart Protection Study, 2002; Hewitt et al., 2012; Page, Sanfilippo, Geelhoed, Briifa & Hobbs, 2012). The third manuscript in this capstone project examines providers' adherence to the AHA/ASA guidelines. The Advanced Practice Nurse is presented with important instrumental challenges to effect changes in the way individuals and communities perceive strokes. Thorough knowledge of effective educational approaches for behavioral

modification is vital if the goal of reducing stroke occurrence utilizing evidence-based practice is to be realized.

The intent of this DNP practice inquiry project is to emphasize the importance of stroke awareness, examine the successes and failures of strategies utilized for improving public knowledge, explore the possibilities for developing more efficient educational modalities to reduce stroke prevalence, to examine the AHA/ASA Stroke prevention guidelines related to women and research a specific primary stroke intervention for one of the many modifiable risk factors (diabetes).

Stroke Awareness: Implications and Strategies for Improvement

An Integrative Review

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Abstract

Strokes are the fourth leading cause of death in the United States and one of the most common causes of adult disability (National Institute of Neurological Disorders and Stroke, 2013). It has been estimated that up to 80% of strokes are preventable by controlling risk factors (NINDS, 2013). Despite recent advances in prevention and treatment for stroke, public awareness of stroke is markedly limited (Goldstein et al., 2011). Developing and implementing an effective educational tool targeted at informing the public of stroke intervention is a healthcare priority. Nine studies were reviewed regarding the lack of awareness of cerebrovascular disease, its implications and ways to reduce the prevalence of cerebrovascular accidents. This review showed a large gap in public awareness of stroke in the context of risk factors, signs and symptoms, and potential for prevention and treatment. The challenge will be to develop new and novel evidence-based educational approaches for modifying and reducing the incidence of stroke in culturally and racially diverse groups.

Key Words: stroke, prevention, education, warning signs, risk factors, awareness

Stroke Awareness: Implications and Strategies for Improvement

Introduction

Cerebrovascular infarct or hemorrhage (stroke) is the fourth leading cause of death and one of the most common causes of adult disability in the United States and currently the second leading cause of death worldwide (Center for Disease Control, 2013; NINDS, 2013; World Health Organization, 2013). By 2020, stroke will become the leading cause of death and disability worldwide (WHO, 2004).

Stroke results from a disruption of the blood supply to the brain. Loss of blood supply secondary to a circulatory vessel occlusion results in a cascade of events, ultimately leading to loss of brain tissue and function. Persons sustaining a stroke may experience loss of movement and/or ability to perceive sensation, inability to speak or understand, and/or loss of vision. On average 795,000 new strokes or recurrent strokes transpire annually within the United States, with approximately 30% of these resulting in death (American Stroke Association, 2012; ASA, 2010; NINDS, 2013).

It has been estimated that up to 80% of strokes are preventable by controlling risk factors (NINDS, 2013). The risks of sustaining a stroke may be either modifiable or unalterable. Some of the major risk factors that are subject to reduction include hypertension, tobacco abuse, dyslipidemia, and glucose intolerance. Risk factors refractory to stroke risk reduction include age, genetics, race, and gender (ASA, 2012).

Despite advances in knowledge and management of modifiable risk factors and acute intervention in the treatment of stroke, there is limited improvement in

the public's knowledge of the symptoms and signs of stroke, stroke-risk reduction behavior, and importance of early recognition and treatment (Miller & Spilker, 2003; Das, Mondal, Dutta, Mukherjee & Mukherjee, 2007). Effective educational interventions to increase public awareness and compliance need to be identified. Investigations to delineate the most effective method(s) have been limited or marginally successful (Goldstein et al., 2011; Davis, Martinelli, Braxton, Kutrovac, & Crocco, 2009; Miller & Spilker, 2003). More research into developing instructional materials that result in enhanced awareness and retention is mandatory if the occurrence of strokes is to be reduced. Boden-Albala et al. (2010) have shown that not only were less than half of a population of lay individuals aware of risk factors and symptoms, but also that a gap existed between knowledge and application.

The Advanced Practice Nurse is presented with important instrumental challenges to effect changes in the way individuals and communities perceive strokes. Thorough knowledge of effective educational approaches for behavioral modification is vital if the goal of reducing stroke occurrence utilizing evidence-based practice is to be realized. The intent of this integrative review is to emphasize the importance of stroke awareness, examine the successes and failures of strategies utilized for improving public knowledge, and explore the possibilities for developing more efficient educational modalities to reduce stroke prevalence.

Critique of Relevant Research Literature

Using the key words of "Stroke Awareness", " Stroke Education", Stroke Intervention", and "Stroke Risk Factors" an extensive review of the literature was conducted using CINAHL, PUBMED, Web of Science, MEDLINE, and Science Direct.

Inclusion criteria were: (a) primary study in nursing or medicine published in English; (b) investigation of the general knowledge regarding risk factors, causes, and potential intervention for stroke; and (c) use of instructional strategies for enhancing public awareness of stroke for efficacy and knowledge retention.

Study Design and Methodology

A variety of study designs were used to assess general stroke awareness**.** Two randomized control studies, three experimental prospective pretest/posttest, two quantitative cross-sectional surveys, one quantitative prospective survey, and one qualitative cross-sectional studies met the criteria for this review. All studies had purposive or convenience sampling. Sample sizes ranged from 60 to 4000 subjects varying in age (13 to 75), ethnicity, level of education, socio-economic status, and included both genders (Miller & Spilker, 2003; Das et al., 2007). Most studies (8) included only asymptomatic individuals, while three studies included both individuals who had and had not sustained a stroke. Five studies were community based and four were hospital based. Both randomized studies were community based and included only asymptomatic individuals. All nine studies included a vulnerable population, e.g., children; elderly; or students in their samples, but only three studies (Boden-Albala et al., 2009; Miller & Spilker, 2003; Miller, et al., 2007) mentioned utilizing informed consent, or providing opportunity to decline participation. Five of nine studies used computer-generated random assignment to appoint participants to either the control group or intervention groups (Boden-Albala et al., 2010; Miller & Spilker, 2003; Davis et al., 2009; Hickey, O'Hanlon, McGee, et al., 2009; Schneider, Pancioli, Khoury, et al., 2003).

Key Findings

Variations of Educational Interventions: Are They Effective?

Only six of the studies investigated baseline knowledge of stroke and the effectiveness of an educational tool. Differing study designs were used to assess general stroke awareness. All six studies were quantitative and five out of the six used pretests and posttests, (Boden-Albala et al., 2010; Davis et al., 2009; Miller et al., 2007; Miller & Spilker, 2003; Hwang, et al., 2010) while one used a cross-sectional survey method (Silver, et al., 2003). The independent variables in these quantitative studies were related to a specific educational tool used to educate, reinforce, and retain stroke knowledge. The dependent variables were comprehension, application, and retention of stroke knowledge.

Multiple data collection methods were used, including surveys (multiple choice, hypothetical scenarios, and open-ended questions), in-person and telephone interviews, self-assessments, and questionnaires. Also, a variety of educational tools and instruments were used in these data collections, thus making comparison between studies difficult. Even though most educational tools showed significant improvement from baseline stroke knowledge, no single educational tool appeared to be ideal for the diversity of all populations.

Davis et al., (2009) found that by using posters there was improvement from baseline but posters, did not significantly improve the knowledge and retention of the signs and symptoms of stroke. Boden-Albala et al., (2010) recorded time from symptom onset to ED arrival: the mean was 46 hours and the median was 12.9 hours. The time to ED arrival differed significantly among different ethnic groups

and educational levels. This translated significantly to the overall mean baseline stroke knowledge survey score between each ethnic group and educational level ($p<0.01$). Boden et al., (2010), also recorded baseline stroke knowledge through a structured, in-person interview that included: demographics, psychosocial, socioeconomic factors, medical history, vascular risk factors, family history of stroke and cardiac disease, cognitive battery, and functional assessment. These standardized questions were adapted from the Behavioral Risk Factor Surveillance System. This information was collected before engaging the Stroke Warning Information and Faster Treatment Study (SWIFT). SWIFT is a culturally tailored interactive stroke preparedness educational intervention that was used to measure stroke knowledge. The study compared the SWIFT interventional groups against basic stroke education. These findings have yet to be disseminated and only baseline knowledge of the study's participants is being reviewed. Using the FAST stroke interventional program, Miller et al., (2007) found significantly improved knowledge of stroke warning signs and risk factors among middle school students ($p< 0.001$) associated with positive influences towards self-efficacy and empowerment to change negative health behaviors ($p<0.001$). Miller and Spilker (2003) found that Brief Intervention (BI) group had higher mean scores over the simple advice and control groups. The BI group scored significantly higher in the following areas: initiated and achieved stroke-risk reduction behaviors ($p=0.005$); knowledge of stroke symptoms ($p=0.001$); and major risk factors ($p=0.01$). Hwang et al., 2010, found after assessing stroke knowledge and retention of both intervention groups closed-end questions (recognition) and open-ended questions

(recall) that the mean score of recognition group was significantly higher than that of the recall group at each test ($p<0.001$). Silver et al., 2003, found a significant increase in ability to name $\geq$ 2 warning signs of stroke in the community when receiving television advertising whether at an intermittent low-level or continuous high level versus print advertising. At follow-up Silver et al., (2003), found no significant change in the print group, except for those $\geq$ 65 years of age and a decrease in the control group at follow up (Silver et al., 2003).

Even though some educational tools showed improvement, no single educational tool appeared to be ideal for the diversity of all populations. A lack of generalizability by using a convenience sample was noted as a limitation for four of the studies (Davis et al., 2009; Miller et al., 2007; Miller & Spilker, 2003; Hwang et al., 2010). Furthermore, the need for protracted study lengths to evaluate knowledge retention is a notable limitation.

Cultural and Socioeconomic Findings.

Boden-Albala et al. (2010) compared culturally tailored, interactive stroke education with standard of care educational handouts and recorded time from symptom onset to ED arrival: the mean was 46 hours and the median was 12.9 hours. This time to ED arrival differed among, Black, Hispanic, and White populations. Hispanics had the lowest arrival time of the three groups (mean 39h, median 11h). Blacks and Whites were similar with a mean arrival time of 52 hours. Educational level differed among these three race-ethnicities. Whites were found about one-third more likely to finish high school (92%) than Blacks (64%) and two-thirds more likely than Hispanic participants (32%) ($p<0.000$). This translated to

the overall mean baseline stroke knowledge score of 71% (Boden-Albala et al., 2010). Whites scored the highest at (77% mean and 79% median), Blacks were second (70% mean and 71% median), and Hispanics the lowest (69% mean and 70% median) ($p<0.01$). Discrepancies in education and race must be taken into consideration when developing educational tools.

Das and associates (2007) showed the average time to arrive at ED after stroke was 34 +/- 6 hours. The arrival time to ED after onset of stroke was influenced by education, socioeconomic status, history of stroke, and the advice of friends and local doctors. The least educated healthy people and stroke patients had the lowest level of knowledge regarding risk factors and warning signs of stroke (Das et al., 2007). Age was also a factor in decreased awareness/knowledge of stroke. Hickey et al., (2009), found that there was a decrease in knowledge among the elderly, especially in those with only a primary education and living within a rural community. Mass media (television) was the number one cited source of knowledge when the pubic was interviewed regarding stroke knowledge (Schneider et al., 2003).

In summary, there is limited general knowledge of stroke. Factors of race, educational level, socioeconomic status, and culture affect stroke knowledge. It is important to understand these limitations so stroke awareness can be increased, warning signs can be recognized earlier and arrival times to ED shortened. Effective, culturally and racially relevant educational interventions and reinforcements are invaluable contributors in affecting modifiable risk factors and improving stroke awareness. These studies have shown that: (a) discrepancies in

education and race must be taken into consideration when developing educational tools; (b) programs for stroke education and awareness should be utilized as early as possible; (c) television yields higher awareness than print advertisement; and (d) recognition questions have better scores than recall questions on stroke knowledge retention.

Gap Analysis

The incidence of stroke remains high despite evidence-based advances in prevention and treatment. Each study in this review found a wide gap between what is known about risk factors in ischemic stroke and individual awareness. Basic information available to the public on the basis of evidence-based medical guidelines is lacking. Although stroke knowledge deficiency was more prevalent in adolescence, elderly, lower socioeconomic status, minority races, and those only receiving a high school education or less; this lack of knowledge about general risk factors was evident in all groups regardless of age, gender, or ethnicity. Nevertheless, the inability to disseminate critical information to individuals in a form that is accessible, understood, internalized and results in improved health care habits limits the ability of evidence-based medicine to affect stroke occurrence and treatment.

In 2010, the annual costs of ischemic cerebrovascular disease and the related cost of disability and loss of production in the United States exceeded $73.7 billion (ASA, 2012). The vast majority of these events potentially can be prevented if translation of evidence denoting specific risk factors can be successfully made to healthcare professionals and the public at large. Finding an accurate and efficacious

educational tool is critical to reduction in stroke occurrence and healthcare expenditures. Knowledge is powerless if unable to be applied.

Conclusion and Recommendations for Evidence-Based Practice

The factors influencing the incidence of stroke occurrence and pre-hospital delay in seeking treatment are related primarily to failures in patient knowledge of risk factors and recognition of stroke symptoms (Boden-Albala et al., 2010; Das et al., 2007). Although evidence-based guidelines for identification and treatment of stroke risk factors have been published, dissemination of this information into the public sphere has been lacking. Indeed, as this review demonstrates, the appropriate and successful educational medium(s) to impart this information remains problematic. These studies ask more than they offer. The studies demonstrated: (a) public awareness of stroke is lacking; (b) educational tools used are inadequate; and (c) education may be more effective when delivered at an early age (Boden-Albala et al., 2010; Miller & Spilker, 2003; Davis et al., 2009; Hickey, O'Hanlon, McGee, et al., 2009; Schneider, Pancioli, Khoury, et al., 2003). Although the theory may be valid that education can be a factor in reducing the incidence of stroke, these collective studies indicate the proper methodology for imparting that knowledge to the community at-large remains to be explored and established. The educational intervention that is most effective is intense individual counseling and if possible at an early age (Miller&Spilker, 2003; Miller et al., 2007). Generic public educational tools, e.g., written materials, surveys and posters, are much less effective and limited in scope (Davis et al., 2009). A much broader, mass media approach is also necessary to successfully accomplish a reduction in stroke rate and

improve acute interventions (Silver et al., 2003). Any educational tool must be predicated on a thorough evidence-based knowledge of stroke as well as an understanding of the socio-economical and psychological environment, contingent attitudes, opinions, and behavioral patterns of the targeted audience. The mass-media ability of television offers a possibility to fulfill these requirements.

Educational programs must be designed to address all aspects of stroke risk factors, signs and symptoms and necessity for emergent treatment specifically targeted to diverse cultures and age groups. The key will be to work within the configuration of the community to develop educational tool(s) that are consistent with the morals, habits, and culture of the individual and the entire community.

The goal for stroke prevention is to increase awareness and change behavior towards risk factors associated with occurrence and increase access to stroke treatments for all eligible patients. To achieve this aim, we need to change people's awareness of and behavior to stroke symptoms by concentrating efforts toward developing mass-media educational tools for all.

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Annotated Bibliography

Reference	Type of Literature/ Design/ Conceptual Framework	Sample	Variables	Purpose of Article	Findings	Implications	Evidence Level & Grade (NGC, 2010)
*Davis et al. (2009)	Qualitative: Single blinded, randomized, pretest, posttest, prospective study, using two age cohorts Extended Parallel Process Model	Convenience Sampling 274 participants of Morgantown, West Virginia; of 2 age cohorts: younger (18-30 years of age) and older (50+ years)	IV: Stroke Poster DV: Public Awareness and information retention of stroke	To assess the comparative effect on public awareness and information retention by using a standard stroke education poster and a standard education poster modified by the health communication s model of Extended Parallel Process.	Posters whether modified or not are not good educational tools for stroke awareness Did not significantly improve the knowledge and retention of s/s of stroke Young better than old but that is limited to the number of elderly participants	Non-significant trend towards gained knowledge and retention with participants viewing the modified poster. Both groups showed improvement from baseline knowledge, but overall insignificant. Posters not good educational tools for stroke awareness and retention. Other educational tools needed to improve stroke awareness and raise retention of awareness.	Level 1 RCT Grade A Directly applicable to the target population, and demonstrating overall consistency of result
*Boden-Albala et al. (2010)	Quantitative: Longitudinal, randomized control trial in a multi-ethnic cohort Social-ecological framework	Purposive Sampling 736 patients of Columbia University Medical Center who have had a stroke or TIA and are: >Over 18 years of age >Living in a household with a telephone	IV: Swift Educational Strategy DV: Stroke Knowledge	To determine whether a culturally Tailored, interactive educational program in a racially and ethnically diverse high risk population aimed at stroke awareness and emergency treatment will lead to increased knowledge, behavioral change, and improved	Clear-cut race discrepancy in knowledge of symptoms and possible intervention of stroke. Educational level differed by race-ethnicity. Whites had higher knowledge scores regarding strokes than Blacks or Hispanics.	The overall mean time from symptom onset to ED arrival was 46-hours, median 12.9 hours Hispanics – mean 39h/median 11h Whites – 52h/11h Blacks – 52h/17h ($p<0.03$) The overall mean baseline "stroke knowledge was	Level 1 RCT Grade A Directly applicable to the target population, and demonstrating overall consistency of results

				arrival time to the ED upon onset of stroke symptoms.		71%, median 71% White: 77%,79% Blacks: 70%,71% Hispanics: 69%,70%	
*Miller et al. (2007)	Quantitative: Experimental prospective, pretest, posttest format Underpinnings of the Social Cognitive Theory	Convenience Sampling 72 Students with the mean age of 13.25	IV: FAST Stroke Prevention Educational Program DV: Awareness of stroke signs and symptoms, risk factors, and risk factor reduction	To evaluate the effects of FAST Stroke Prevention Educational Program for middle school students. To improve awareness of stroke signs and symptoms, risk factors, and risk factor reduction.	Significant increase in knowledge in young people. Improved knowledge of stroke warning signs and risk factors of stroke. Positive influence towards self-efficacy and empowerment to change negative health behaviors. FAST mnemonic recall	Programs for stroke education and awareness should be a life long tool Populations and communities at an early age can be affected Educational tools for strokes should be directed as early as possible Necessity for continued research in the younger populations for stroke awareness and retention	Level 2 Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal Grade C directly applicable to the target population and demonstrating overall consistency of results;
*Miller & Spilker (2003).	Quantitative: Prospective, experimental Design of a repeated measures design that had three groups: control, advice, and brief educational intervention. Brief Intervention Model linked with the Stage of Readiness to Change	Convenience /Purposive Sampling 60 patients from a university family practice center who were able to coherently speak English, had a score of ≥ 8 on the 10-item Short Portable Mental Status Exam, could not identify all four stroke symptoms,	IV: educational strategy of Brief Intervention DV: readiness to initiate behaviors to reduce stroke.	To determine whether (a) patients at risk for stroke in one of three groups have differences in the number of newly initiated and achieved behaviors to reduce their stroke risk; (b) patients at risk for stroke have differences in the umber of identified stroke symptoms, major stroke risk factors, or description of treatment –	75% of participants who were evaluated by the NSA Stroke Risk Appraisal at being at risk for stroke had never been told so by their healthcare provider. BI group had a higher success rate in behavior changes for reducing stroke-risks and increasing their	The BI group had a significantly higher number of newly initiated and achieved preventative stroke-risk-reduction behaviors compared to the other two groups. The BI group had the greatest positive change from pre-test to post-test regarding knowledge of stroke	Level 1 Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias. Grade A A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstra-ting overall consistency of results

		could not correctly state the major stroke – risk factors, and were identified as at risk for stroke by their medical history.		seeking behavior when a stroke is suspected; and (c) a patient's age, readiness to change, perceived health status, functional status, martial status, quality of life, or level of depression influence the initiation of behaviors to reduce stroke or increase knowledge of stroke warning signs or risk factors.	knowledge of stroke awareness.	symptoms, major risk-factors, and treatment-seeking behaviors. Nurses along with effective educational reinforcements such as BI are an invaluable contribution in reducing modifiable risk factors and improving stroke-related knowledge. Relationships pertaining to race, spirituality, and behavior achievement need to be more closely studied in future research pertaining to the BI process.	
Das et al. (2007)	Qualitative: Cross-sectional No conceptual framework identified	Purposive Sampling 660 stroke patients discharged from Burdwan Medical College and Hospital and 4,000 healthy people from the general population who accompanied the patients.	N/A	To evaluate general awareness of the risk factors for stroke, as well as the associated symptoms, to plan a public educational program to reduce the incident of stroke and to improve stroke care.	Arrival time to ED after onset of stroke and stroke knowledge are influenced by education, socio-economic status, history of stroke, and the advice of friends and local doctors.	Average time to ED after stroke was 34 +/- 6 hours. Limited knowledge of stroke s/s Less educated people and stroke patients had the lowest level of knowledge regarding risk factors and warning signs of stroke Important to increase awareness so that warning symptoms are recognized earlier and arrival times to	Level 3 Non-analytic studies Grade D Evidence level 3 or 4

						ED are shortened.	
Hickey et al. (2009)	Quantitative Cross-sectional Survey No conceptual Framework identified	Convenience Sampling 2,033 Randomly selected community-dwelling older people (65+ years) in Ireland.	N/A	To examine knowledge of stroke warning signs and risk factors among community-dwelling older adults.	Less than half of the sample could identify stroke risk factors and/or stroke warning signs. Lack of stroke awareness was higher in the elderly and even more so in the population with only a primary education and living in a rural community.	Vital time will be lost for medical intervention due to the lack of knowledge regarding stroke.	Level 3 Non-analytic studies Grade C Evidence is from outcomes of uncontrolled or nonrandom-mized trials or from observational studies.
*Hwang et al. (2010)	Quantitative: Experimental prospective, pretest, posttest format No conceptual framework identified.	Convenience Sample 138 college students at a university in Taiwan	IV: Educational Intervention DV: Closed-ended or open-ended questionnaire group	To investigate undergraduate awareness about stroke and examine whether educational videos and a series of lectures would increase knowledge of stroke. The students were divided into two groups and closed- ended questionnaires and open0ended questionnaires were compared at pretest and posttest to evaluate which testing method attributed higher scores.	The mean score of the recognition group was significantly higher than that of the recall group.	Large knowledge deficit in stroke signs and symptoms and stroke risk factors in undergraduate students. Educational interventions can significantly improve knowledge towards stroke.	Level 2 Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal Grade B Evidence is from endpoints of intervention studies that include only a limited number of patients
*Silver et al. (2003)	Quantitative: Cross-sectional survey No conceptual framework	Convenience Sampling Members of one of four communities ≥ 45 year years of age living in Ontario.	IV: mass media educational stroke programs DV: Stroke awareness	To examine the effect of mass media as an educational intervention to increase stroke awareness.	Television advertising significantly increased stroke awareness in both men and women, and people of with less than a	Television effectiveness proven to increase stroke awareness, but unknown if this will translate to a change in behavior and more timely	Level 2 Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship

	identified.	n= 3,133			secondary level of education, but not those ≥ 65 years of age.	arrival time to ED.	is causal Grade B Directly applicable to the target population, and demonstra-ting overall consistency of results
Schneider et al. (2003)	Quantitative: Population based random telephone survey. No conceptual framework identified	Convenience Sampling: 2173 randomly selected from all residents in a 5-county region around Cincinnati, OH.	N/A	To examine temporal trends in public knowledge of stroke warning signs and risk factors.	70% of respondents correctly named at least 1 established stroke warning signed compared to the poll conducted in 1995 at 57%. Television was also cited as the most frequent source of knowledge.	Public awareness is not at a desirable level especially in at risk populations. Continued focus towards stroke awareness needs direction towards at risk populations. Since television is most frequently cited as a source of stroke information, campaigns should be targeted towards mass media approaches.	Level 3 Non-analytic studies Grade D Evidence level 3 or 4

An Analysis of a Clinical Practice Guideline for The Prevention of Stroke in Women

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Scope and Practice

Stroke is currently one of the leading causes of death worldwide. Ongoing research has focused on ways to reduce the incidence and mortality rates associated with this condition. Through past research it was discovered that stroke was more prevalent in the female population. As a result of these findings, a focus has currently been placed on assessing stroke risk factors and prevention strategies in women. The purpose of this paper is to use a modified version of the Appraisal of Guidelines for Research and Evaluation (AGREE) Instrument (2001) to analyze the guideline written by the American Heart Association and the American Stroke Association regarding prevention, detection, evaluation and treatment of stroke in women. The Guideline for the Prevention of Stroke in Women (Bushnell et al., 2014) provides evidenced-based recommendations for all healthcare providers regarding the recognition and management of stroke risk factors that are specific to or more common in women. The guideline was published in the American Heart Association journal *Stroke.*

Cerebrovascular infarct or hemorrhage (stroke) is the fourth leading cause of death and one of the most common causes of adult disability in the United States. It is currently the second leading cause of death worldwide (Centers for Disease Control, 2013; National Institute of Neurological Disorders and Stroke, 2013; World Health Organization, 2013). By 2020, stroke will become the leading cause of death and disability worldwide (WHO, 2004).

Stroke results from a disruption of the blood supply to the brain. Loss of blood supply secondary to a circulatory vessel occlusion results in a cascade of

events, ultimately leading to loss of brain tissue and function. Persons sustaining a stroke may experience loss of movement and/or ability to perceive sensation, inability to speak or understand, and/or loss of vision. On average 795,000 new cases of strokes or recurrent strokes occur annually within the United States, with approximately 160,000 of these resulting in death (American Stroke Association, 2012; NINDS, 2013).

In 2009, strokes accounted for 5% (5th leading cause) of all deaths in Kentucky, and the state was ranked 11th nationally for stroke mortality rates (American Heart Association, 2013; Kentucky Cabinet of Health and Family Services, 2014). Residents of Kentucky are highly susceptible to stroke by living within the "stroke belt", which places them at higher risk for contributing stroke risk factors. (Liao, Greenlund, Croft, Keenan & Giles, 2009). (See Appendix A) The stroke belt consists of the following states: Alabama, Arkansas, Georgia, Indiana, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia (Liao et al., 2009). When states within the stroke belt were compared to states outside of the stroke belt factors such as socioeconomic status, race/ethnicity, and education of the representative populations were found to correlate with stoke prevalence. These cultural indicators often associated with an increased prevalence of other stroke specific risk factors such as obesity, smoking, hypertension, diabetes, and coronary heart disease (Liao et al., 2009).

It has been estimated that up to 80% of strokes are preventable by controlling risk factors (NINDS, 2013). The risks of suffering a stroke may be either modifiable or non-modifiable. Some of the major modifiable risk factors include

hypertension, tobacco abuse, dyslipidemia, and glucose intolerance. Non-modifiable risk factors for stroke are age, genetics, race, and gender (ASA, 2012).

Female gender is a non-modifiable stroke risk factor. Stroke is the third leading killer of all women in the United States, and the fourth leading cause in men (AHA/ASA, 2014; CDC, 2013). Women suffer from 55,000 more strokes annually, and die from strokes more often than men each year (AHA/ASA, 2014). Some of the stroke risk factors that are exclusive to women or affect women more often than men are as follows: pregnancy and preeclampsia, oral contraceptive use, hormone replacement therapy, migraines with auras, metabolic syndrome, and atrial fibrillation (AHA/ASA, 2014).

In addition to the often-devastating consequences of stroke in women there are financial implications to consider. In 2010, the annual costs of ischemic cerebrovascular disease and the related cost of disability and loss of production in the United States exceeded $73.7 billion (ASA, 2012). As the population ages so does the economic impact of presiding health disparities, especially stroke. In 2010, stroke-related hospitalizations cost the state of Kentucky over $329 million (KCHFS, 2014).

The evolution and consequences of these findings warrant evaluation to provide practitioners with a guideline to aid prevention of first stroke in women. In conglomeration with early recognition and intervention, the potential for stroke may be deferred through modifiable risk factors such as hypertension, glycemic control, and smoking cessation.

Stakeholder Involvement

The stakeholders involved in the creation of this guideline are numerous. For several decades the American College of Cardiology (ACC) and the American Heart Association (AHA) have partnered together to make the highest quality evidence based guidelines for healthcare professional on topics of cardiovascular disease and stoke (AHA, 2010). These two bodies have published many scientific works along with clinical practice guidelines, and include other recognized medical organizations when appropriate. The American Heart Association (AHA) and American Stroke Association (ASA) work together in producing evidenced-based information regarding cerebrovascular and cardiac disease and are recognized by most as the leaders in both (AHA, 2010).

The AHA and American College of Cardiology Foundation (ACCF) have created a Task Force and Manual to oversee the writing committees duties and guideline production (AHA, 2010). The Task Force members are senior experts in cardiology and other various fields of study and are accustomed to being on a guideline writing committee. The specific groups listed in this guideline were as follows: the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, Council in Epidemiology and Prevention, and the Council for High Blood Pressure Research (AHA/ASA, 2014). These councils were made up of multiple disciplines, including neurology, neuroscience research, internal medicine, obstetrics/gynecology, cardiology, pharmacy, nursing, epidemiology and public policy (AHA/ASA, 2014). The American Academy of Neurology and the American Association of Neurological

Surgeons and Congress of Neurological Surgeons fully endorse this guideline as well (AHA/ASA, 2014). As seen above, all relevant scopes of practice were included in this gathering of information. No modality appears to be left out upon review.

The AHA created this guideline with healthcare providers to be the target audience and not the patient. Patient stroke awareness was included to illustrate the lack of stroke knowledge (awareness and risk factors) as an identifiable gap to the provider.

Rigor of Development

The AHA/ASA (2014) guideline for the prevention of stroke in women provides clear information about the search strategy including databases, types of researched utilized, and grading of evidence. The aforementioned Task Force nominated members to be on the writing committee and appoint a chairperson. A support staff of a research analyst/evidence-based medicine specialist and document manager assisted the writers with the methodology process of guideline development (AHA, 2010). The AHA Stroke Council's Scientific Statement Oversight Committee and the AHA Manuscript Oversight Committee approved all writing committee members.

Although not specified in the methodology of this guideline, the AHA Writing Committee reviewed relevant literature on adults only, using computerized searches through the date of March 15, 2013 (AHA/ASA, 2014). A specific search list of medical subject headings was not provided. No exclusionary criteria were listed upon review of this guideline. "Each AHA/ASA guideline adheres to levels of evidence and classes of recommendation derived from ACC/AHA Guidelines Task

Force. All AHA scientific statements undergo blinded peer review and are reviewed and approved by the AHA Science Advisory and Coordinating Committee (SACC), the highest scientific body of the AHA/ASA (AHA, 2010)."

This guideline underwent extensive internal AHA peer review, Stroke Council Leadership review, and review of the Scientific Statements Oversight Committee (AHA/ASA, 2014). The guideline addresses several topics related to stroke in women based on substantial evidence-based literature. The key recommendations are explicitly linked with supporting evidence. With each recommendation the writers include the statement of the clinical objective, list of the recommendation(s), list the classification and level of the supporting evidence, give a description of the recommendation and evidence, references, and include an evidence table and/or graphs for illustration. This guideline did an excellent job in providing a narrative and visual synthesis of information for the reader.

Over 400 scientific, peer-reviewed studies were reviewed and incorporated into the AHA/ASA guideline for stroke prevention in women. These studies included multiple meta-analysis and randomized clinical trials, single randomized trial or non-randomized studies, multiple prospective cohort studies, expert position statements, and case studies (AHA/ASA, 2014). The health benefits and harm of the interventions were covered effectively. However, cost-effectiveness was not addressed in this guideline.

The ACCF/AHA Task Force is continuously exploring new evidence and processes to update guideline content. The Task Force reviews all guidelines one year after they are published and yearly thereafter for possible updates. The

Research Analyst and the Task Force chair monitor significant new clinical trials and peer reviewed literature on the topic, and compare the current guideline recommendations against the latest data. The writing committee is then surveyed to determine if the guideline or sections within the guideline need updating.

Clarity and Presentation

The key recommendations are easily identifiable to the reader. Recommendations are provided for stroke prevention in women in the following categories: prevention of preeclampsia and treatment of hypertension in pregnancy and post-partum; cerebral venous thrombosis screening and treatment; oral contraceptive use screening and treatment; postmenopausal hormone therapy treatment; migraine with aura treatment with smoking cessation; obesity/metabolic syndrome/lifestyle screenings and interventions; atrial fibrillation screening and treatment; and carotid stenosis screening and treatment. The AHA/ASA (2014) guideline provides the examiner a thorough navigation through: the importance of early detection, linkage with cerebrovascular complications, the importance of risk factor and prevention management, and improving a woman's risk of not having a stroke (AHA/ASA 2014). The AHA/ASA (2014) guideline, focused on risk factors that are unique to and more common in women. These topics included: reproductive factors, migraine with aura, metabolic syndrome, and atrial fibrillation. Some stroke risk topics that are not covered in detail include management of diabetes mellitus and cholesterol, because there are no female specific recommendations for these risk factors. This guideline also included reviews on

existing stroke risk scoring methods, which demonstrated the need for further research based on women specific risk factors and scores.

Each category is supplied with evidenced-based literature, evidence tables and/or graphs supporting their recommendations. The guideline has charts, graphs, and tables to determine and monitor the success of treatment. The guideline incorporates different management options for distinct patient population types. Some examples of a different patient population management would be treatment for hypertension during pregnancy or the association with different postmenopausal hormone replacement therapy and stroke risk (AHA/ASA, 2014).

The AHA/ASA (2014) recommendations can be employed in all clinical settings pertaining to women to aid in the prevention and therapeutic treatments to prevent primary stroke. Each categorical topic has a *Summary and Gaps* conclusion paragraph to inform the reader of what the literature has found and what still needs to be discovered.

Application

The AHA/ASA (2014) guideline did not discuss, at any length, potential organizational barriers. Only knowledge gaps within the literature to inform stroke risk identification when pertaining to women sub-groups were discussed. Also, cost implications to the provider, patient or nation were not addressed. However, the cost to the provider seemed as if they would be minimal.

Theoretical Framework

The Health Belief Model (HBM) is one of the most widely used conceptual frameworks for understanding health behavior in context of health education and

health promotion. Social Psychologists (Hochbaum, 1958; Rosenstock, 1960, 1974) developed this model in the mid-twentieth century to explain limited participation of individuals in US Public Health Service medical screening interventions. This model has been revised and expanded by incorporating individual expectations and perceptions (Glanz, Rimer, & Viswanath, 2008).

The Health Belief Model (HBM) is constructed around an individual perception of health and the methodical rationales upon which suppositions and opinions are formed. The major theoretical constructs of the HBM are as follows: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Glanz et al., 2008). The HBM will aid disclosure of what is considered healthy or non healthy to an individual or group, why they believe so, and how they plan to adapt their lifestyle to encompass or reject a specific belief (Glanz et al., 2008). The HBM can aid the practitioner and the individual to maximize participation in health promotion against stroke, evaluate behaviors as to why an individual has risk factors for stroke and what modifications will need to be made in order to produce a change for the better. The advanced practice nurse must consider the entwinement of the multiplicity of intrapersonal factors such as; environment, socioeconomic resources, and moral attributes that influence personal perception. By addressing each and investigating these as an entity, one might be able to see the interdependence of all, thusly becoming better prepared to deal with the complexity of an individual seeking care.

Prevention is key to healthy outcomes. As a primary healthcare provider, the advanced practice nurse is a pivotal in providing pre-emptive care for stroke in

women. The concepts examined in the HBM are essential to the advance practice nurse in pinpointing areas of concern, and propelling care and interventions in the direction needed to create a positive change. The HBM is an empirically tested model and focuses on prevention and facilitates the understanding of client health perspectives (Glanz et al., 2008). Susceptibility is the driving force behind the model: the higher perceived susceptibility to illness, the more likely the individual will feel exposed to a specific health problem, and thus, more likely to seek expert advice. The salient features of this model are to identify factors that influence attitudes towards health, pursuit of healthcare, and consequences of both. Health promotion along with prevention and management of stroke is a feasible healthcare provider goal, especially when guided by the Health Belief Model and following the AHA/ASA guideline.

Editorial Independence

The guideline has a clear statement that the work done was completely supported by the AHA and ASA (which is a division of the AHA, founded in 1997) and that great lengths are taken to avoid any actual or potential conflict of interests. The guideline stated that the American Heart Association makes every effort to avoid any actual or potential conflicts of interest whether personal, professional, or business interest of a member of the writing panel (AHA/ASA, 2014). All members of the writing panel were required to complete and submit a Disclosure Questionnaire that would show any such conflict of interests. The guideline also included a table derived from this questionnaire, and listed any perceived conflict and the reason as to why (AHA/ASA, 2014).

Recommendations

Currently, there are no comparable guidelines specific to women's stroke risk and prevention of stroke in the U.S. or worldwide. After searching over 370 guidelines with search terms of "stroke", "stroke prevention", "primary stroke" and "stroke in women" on the National Guideline Clearinghouse through Agency for Healthcare Research and Quality; only one guideline, among U.S. literature, was applicable regarding primary stroke prevention. This guideline was the AHA/ASA (2011) Guidelines for the Primary Prevention of Stroke. Many other guidelines exist regarding secondary stroke prevention, acute stroke care and intervention, and individualized stroke risk factor recommendations. Since this guideline was issued from the same national organization, it is supported from the same research and implementation standards as the AHA/ASA 2014 guideline. To date these are the only primary stroke prevention guidelines within the United States. The AHA/ASA 2014 guideline directs the reader to the aforementioned guideline when issues of stroke risk arise pertaining to both men and women equally. Furthermore, both AHA/ASA primary stroke prevention guidelines should be taken into consideration among healthcare providers for all persons across the continuum of care.

The AHA/ASA (2014) guidelines overall did an outstanding job in providing evidence and recommendations on many key topics relating to prevention of stroke in women, including charts and graphs focused on female specific stroke risk factors and treatment options.

The AHA/ASA (2014) Stroke Prevention in Women is a highly reputable and sound guideline and supports its recommendations with the most esteemed and

current scientific evidence available. This guideline comes highly recommend for all primary care providers, including nurse practitioners. The authors of this guideline state that their goal was three-fold: to review risk factors that are either unique to women or affects women's risk of stroke differently; to determine if there is a need for a female-specific stroke risk score; and to empower women and their families by understanding their personal risk factors and how they can reduce their chance of stroke.

Summary

All adult individuals should be knowledgeable of stroke and stroke risk factors, especially women. In conjunction with providing important personal health promotion, the advanced practice nurse should seek to identify specific risk factors, educate their patients in ways to reduce these risks, and advise therapeutic interventions as warranted based on the AHA/ASA guidelines. An aggressive approach to screening, establishing the presence of specific stroke risk factors, and intervening will reduce the prevalence of first stroke. In turn, reducing its calamitous consequences that plague our society and contribute to the rising costs of healthcare.

The importance of modeling and introducing a clinical practice guideline aimed at reduction of first stroke in women cannot be over estimated. The importance lies in the potential to individually and publically integrate, in an efficient and effective manner, the evidenced based clinical guidelines established by the AHA/ASA, and to promote awareness of the ability to reduce primary stroke incidence while better managing control over modifiable stroke risk factors.

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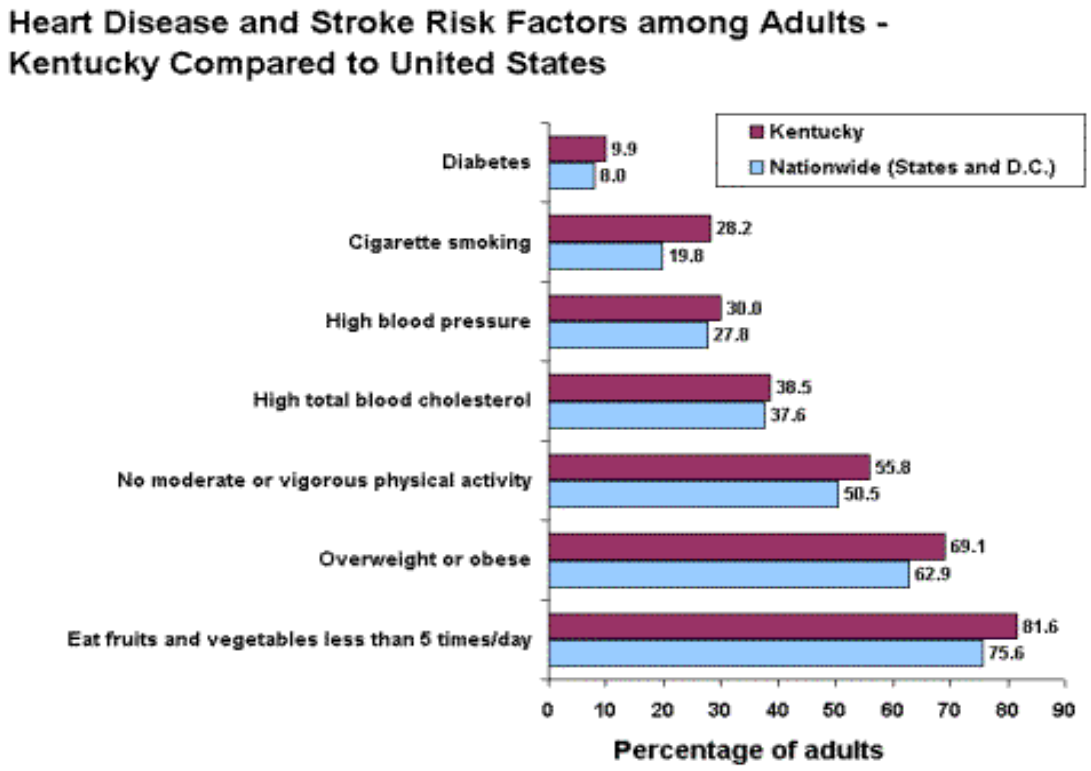
Appendix A



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Primary Stroke Prevention:

3-hydroxy-3-methyl-glutaryl-coenzyme A (HMG-CoA) Reductase Inhibitor (statin)

Use in the Diabetic Patient

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Abstract

Purpose: The primary objective for this retrospective chart review was to evaluate provider adherence to the 2011 AHA/ASA Primary Stroke Prevention guideline of prescribing a statin to all diabetic patients for primary prevention of stroke, regardless of dyslipidemia. A second aim of this study is to identify provider facilitators and barriers to prescribing a statin therapy for primary prevention.

Methods: Using a retrospective study design, a random sample of 100 medical records of diabetic patients presenting to a university women's health clinic within the previous year were reviewed for statin use and rationale.

Results: Of the 100 diabetic patients sampled, only 69% were currently prescribed a statin therapy. Furthermore, only one patient had a diabetic rationale for statin use. Primary stroke prevention counseling and therapy aimed at prevention of primary stroke will be completed at a future date.

Conclusion: In this clinic setting there is no documentation of adherence to the 2011 AHA/ASA Primary Stroke Prevention Guideline recommendation that statin therapy be used as a primary prevention in the diabetic population.

Introduction

Stroke incidence in women and the specific impact of diabetes risk and primary prevention strategies has yet to be investigated. Stroke prevention in women with diabetes is a serious undertaking as stroke was found to be more prevalent and more fatal in the female population (American Heart Association/American Stroke Association [AHA/ASA], 2014). Heart disease and stroke are the number one causes of death and disability among people with type 2 diabetes (AHA, 2013). Diabetics are 2 to 4 times more likely to have heart disease or stroke than adults without diabetes (AHA, 2013). Stroke is currently one of the leading causes of death worldwide. Ongoing research has focused on ways to reduce the incidence and mortality rates associated with stroke in the diabetic population. The purpose of this paper is to describe the results of a retrospective chart review at a women's primary care university health clinic in the southeastern United States. The review will examine provider guideline adherence for primary stroke prevention in diabetic women through the use of prescribing a HMG-CoA Reductase Inhibitor (statin).

Scope and Practice

Cerebrovascular Disease

Cerebrovascular infarct or hemorrhage (stroke) is the fourth leading cause of death and one of the most common causes of adult disability in the United States. It is currently the second leading cause of death worldwide (Centers for Disease Control [CDC], 2013; National Institute of Neurological Disorders and Stroke

[NINDS], 2013; World Health Organization [WHO], 2013). By 2020, stroke will become the leading cause of death and disability worldwide (WHO, 2004).

Stroke results from a disruption of the blood supply to the brain. Loss of blood supply secondary to a circulatory vessel occlusion results in a cascade of events, ultimately leading to loss of brain tissue and function. Persons sustaining a stroke may experience loss of movement and/or ability to perceive sensation, inability to speak or understand, and/or loss of vision. On average 795,000 new cases of strokes or recurrent strokes occur annually within the United States, with approximately 160,000 of these resulting in death (ASA, 2012; NINDS, 2013).

It has been estimated that up to 80% of strokes are preventable by controlling risk factors (NINDS, 2013). The risks of suffering a stroke may be either modifiable or non-modifiable. Some of the major modifiable risk factors include hypertension, tobacco abuse, dyslipidemia, and glucose intolerance. Non-modifiable risk factors for stroke are age, genetics, race, and gender (ASA, 2012).

Women and Cerebrovascular Disease

Female gender is a non-modifiable stroke risk factor. Stroke is the third leading killer of all women in the United States, and the fourth leading cause in men (AHA/ASA, 2014; CDC, 2013). Women suffer from 55,000 more strokes annually, and die from strokes more often than men each year (AHA/ASA, 2014). Some of the stroke risk factors that are exclusive to women or affect women more often than men are as follows: pregnancy and preeclampsia, oral contraceptive use, hormone replacement therapy, migraines with auras, metabolic syndrome, and atrial fibrillation (AHA/ASA, 2014).

Cerebrovascular Disease in Kentucky

In 2009, strokes accounted for 5% (5th leading cause) of all deaths in Kentucky, and the state was ranked 11th nationally for stroke mortality rates (AHA, 2013; Kentucky Cabinet of Health and Family Services [KCHFS], 2014). Residents of Kentucky are highly susceptible to stroke by living within the "stroke belt", which places them at higher risk for contributing stroke risk factors (Liao, Greenlund, Croft, Keenan & Giles, 2009). The stroke belt consists of the following states: Alabama, Arkansas, Georgia, Indiana, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia (Liao et al., 2009). When states within the stroke belt were compared to states outside of the stroke belt factors such as socioeconomic status, race/ethnicity, and education of the representative populations were found to correlate with stoke prevalence. These cultural indicators often lead to an increased prevalence of other stroke specific risk factors such as obesity, smoking, hypertension, diabetes, and coronary heart disease (Liao et al., 2009).

In addition to the predominately devastating consequences of stroke are the financial implications to consider. In 2010, the annual costs of ischemic cerebrovascular disease and the related cost of disability and loss of production in the United States exceeded $73.7 billion (ASA, 2012). As the population ages so does the economic impact of presiding health disparities, especially stroke. In 2010, stroke-related hospitalizations cost the state of Kentucky over $329 million (KCHFS, 2014).

Diabetes

Diabetes affects 25.8 million people in the United States, 8.3% of the population, and an estimated 7 million people are undiagnosed (CDC, 2011). Diabetes is the leading cause of kidney failure, non-traumatic lower limb amputations, and blindness among adults in the United States (CDC, 2011). Diabetes is a major cause of stroke and heart disease, and the seventh leading cause of death in the U.S. (CDC, 2011). Diabetes also exhibits a disproportionate strain on racial and ethnic minorities (reportedly Hispanics (11.8%), African Americans (12.6%), and American Indians (33%) when compared to Caucasians (7.1%); with higher prevalence rates, more complications and worse diabetic control (Peek, Cargill & Huang, 2007; CDC, 2011). Minority groups were also found to have lower quality of care (outcomes) (Peek et al., 2007).

Total cost (indirect and direct) in 2012 is equal to 254 billion dollars annually, a 41% increase from the cost 5 years before in 2007 (American Diabetes Association, 2013).

Diabetes and Stroke

One-third of all acute stroke patients have diabetes mellitus (Karsito, 2008). Diabetics are at an increased risk for stroke due to several factors. Diabetics have a decreased endothelium-dependent vasodilatation due to decreased or impaired nitric oxide (NO) production, which causes atherosclerotic plaques to be destabilized (Air & Kissela, 2007). Diabetics also are in a chronic inflammatory state, which leads to hypercoaguability and hyperaggregation, and have been found to have an increase carotid intima-media thickness (CIMT) (Air & Kissela, 2007).

Carotid bruit screening should be considered in all diabetic patients. Incidental findings of carotid bruits in asymptomatic diabetic patients have been found to have a greater than 6 times the risk of first stroke in the first 2 years of finding, than those without a bruit (Karsito, 2008). Additional future risk factors for stroke in diabetics are QTc interval prolongation, and proteinuria (3.23 times increase risk for stroke) (Karsito, 2008). Karsito (2008) also found that the peak age of stroke for black diabetic Americans was 34-45 years of age, and 45-64 years of age in white diabetic Americans.

Statin Use in Diabetics

Statins have been contributors in reducing stroke since their arrival to the medical world, by reducing and stabilizing plaques within the arteries. Diabetics are at higher risk for developing dyslipidemia due to glucose attaching to LDL, causing glycated lipoproteins to stay in the blood stream longer and wreak havoc within the blood vessels, leading to atherosclerosis (Bucala, 1997; Lopes-Virella, Klein, Lyons, Stevenson & Witztum, 1988). Statins help up-regulate NO synthesis and stabilize atherosclerotic plaques (Air & Kissela, 2007). Statins exert protective effects against stroke independent of changes in cholesterol levels (Air & Kissela, 2007; AHA/ASA, 2011). Statin treatment can now be recommended for stroke prevention even in patients who do not have cardiovascular disease, regardless of diabetes status (Air & Kissela, 2007). However, diabetic patients benefit greatly from statin treatment and should consider statin use for their stroke prevention regimen (Air & Kissela, 2007).

Several studies have shown the protective benefit of statin therapy against stroke, in patients without cardiovascular disease and/or dyslipidemia. This benefit is even more magnified in the diabetic population due to its lipid-lowering and anti-inflammatory roles (Lakhan, Bagchi, & Hofer, 2010).

Treatment with a statin showed a significant 25% risk reduction in the first-time occurrence of major cardiovascular and cerebrovascular events in diabetic patients with and without vascular disease (De Vries, Denig, Pouwels, Postma and Hak, 2012; Kearney, et al. 2008). Beneficial effects of primary statin therapy in acute ischemic stroke were also shown in: whites, diabetics, elderly patients with hypertension and other vascular diseases, and patients with ideal low-density lipoprotein (LDL) levels (Lakhan et al., 2010).

Specific Satin Use in Stroke Prevention

In the Heart Protection Study (2002), simvastatin produced a substantial 24% reduction of first cardiovascular and/or cerebrovascular events, irrespective of their initial cholesterol concentrations. Pravastatin reduced stroke occurrence by 12% and all other statins by 24% (Cheung, Lauder, Lau & Kuman, 2004). The use of atorvastatin 10 mg daily in type 2 diabetic patients with no history of cardiovascular disease and without high LDL cholesterol concentrations demonstrated a substantial reduction in reduction of stroke (48%); major cardiovascular events (37%); and (27%) in all-cause mortality (Colhoun et al., 2004).

Clinical Practice Guidelines

In 2011 the AHA/ASA developed, Guidelines for the Primary Prevention of Stroke: A Guideline for Healthcare Professionals. This guideline was originally

published as: A Statement for Healthcare Providers on Primary Prevention of Ischemic Stroke in 2001. It was revised and became a guideline in 2006 and revised and republished again in 2011. "This guideline provides an overview of the evidence on established and emerging risk factors for stroke to provide evidence-based recommendations for the reduction of risk of a first stroke (AHA/ASA, 2011, p.517)."

The recommendations from this guideline are as follows:

> Recommendation: (*Class I; Level of Evidence A)*
> 1. Treatment of adults with diabetes with a statin, especially those with additional risk factors, is recommended to lower risk of a first stroke
>
> 2. Treatment with an HMG-CoA reductase inhibitor (statin) medication in addition to therapeutic lifestyle changes with LDL-cholesterol goals as reflected in the NCEP guidelines is recommended for primary prevention of ischemic stroke in patients with coronary heart disease or certain high-risk conditions such as diabetes (AHA/ASA, 2011, p. 532, 535)

The AHA/ASA (2011) guideline discussed the benefits of high-intensity statin therapy in diabetics on ischemic stroke by causing a reduction of progression or induced regression of atherosclerosis and a reduction carotid intima media thickness (IMT). Also, patients who were treated with a statin and had type 2 diabetes (with at least 1 additional risk factor; retinopathy, albuminuria, current smoking, or hypertension; and a (LDL) of <160 mg/dL without a prior history of CVD resulted in a 48% reduction in stroke (AHA/ASA, 2011).

Similarly, the Adult Treatment Panel IV (ATP IV) guidelines have recommended that all patients with diabetes (age 40-75 years) with LDL70-189 mg/dl and without any evidence of CVD should receive moderate dose statin

therapy as follows: atorvastatin 10-20mg, rosuvastatin 5-10 mg, pravastatin 40-80 mg, simvastatin 20-40 mg; and to consider high dose statin if 10-yr risk is >7.5 % (Stone et al., 2013).

The evolution and consequences of these findings warrant evaluation to provide practitioners with a guideline to aid prevention of first stroke in diabetic women. In conglomeration with early recognition, the potential for stroke may be deferred through intervention of such a high-risk modifiable factor as diabetes.

Retrospective Chart Review

Objectives

The primary objective for the retrospective chart review was to evaluate provider adherence to prescribing a statin to all diabetic patients for primary prevention of stroke, regardless of dyslipidemia.

Methods

Study Designs and Data Extraction.

The design of this study was a descriptive retrospective chart review. Approval for the completion of this study was obtained from the university Institutional Review Board (IRB) prior to data collection. A data extraction Excel spreadsheet was created used to collect data. The data were de-identified prior to being recorded on the data extraction form. A list of 244 medical record numbers was obtained and a randomly selected sample of 100 electronic patient medical records from July 1, 2012 to July 31, 2013 was selected. The sample n=100, was selected using a populated random number software (RANDOM, 2014). This software states that it is a true random number service that generates randomness

via atmospheric noise. Medical records were reviewed for 49 different items; see (Appendix A) for list of patient information collected. All the de-identified data collected during the review were stored on the principal investigator's personal password protected laptop.

Inclusion and Exclusion Criteria.

A primary women's health clinic was the location for this study. Inclusion criteria consisted of: any patient seen in the Women's Clinic with Diabetes Type 1 or Diabetes Type 2 (ICD-9 Codes, 230.00-250-93), 18 years of age or older, and seen by any provider between the dates of July 1, 2012 to July 31, 2013. Since the focus of this study is primary prevention; exclusion criteria included any patient who had a previous history of a cerebrovascular accident (CVA).

Study Population.

This study was completed in a women's primary care practice located in an urban, university setting. The practice consists of physicians and nurse practitioners that provide primary care for women ranging in age from 18 years and up.

Data Analysis

Results from the retrospective medical record review were analyzed using Statistical Analysis System (SAS) 9.3 software. Descriptive statistics were used to assess age, race, insurance type, stroke risk factors, active diagnoses related to stroke risk factors, prescribed statin, and rationale for or against statin use. Medication related to diabetes, hypertension, dyslipidemia, anticoagulation, and depression, as well as the associated ICD-9 codes, were also recorded.

Results

Of the 100 medical records reviewed, the mean patient age was 57.5, the median age 59, with patients ranging in age from 27-91 years old. Seventy-five percent were Caucasian and the remaining 25% were African American. Out of the 100 diabetic patients, 69 were on a statin therapy and 96% of those on a statin had a dyslipidemia diagnosis for the rationale; 3% coronary artery disease (CAD); and 1% diabetes. In reviewing rationales against statin therapy, 7% of the 31 patients not on a statin listed "statin-intolerance" as their reasoning and the remaining had no rationale listed for not prescribing a statin. Several specific-stroke risk factors of this population were also reviewed: BMI >25 (98%), tobacco use (14%), alcohol use (45%), hypertension (82%), dyslipidemia (82%), coronary artery disease (CAD) (12%), atherosclerosis (14%), migraine with aura (2%), hormone replacement therapy (HRT) (11%), and atrial-fibrillation (3%). Diabetics were found to have a high percentage (82%) of co-existing conditions of hypertension and dyslipidemia.

Discussion

An assumption for primary prevention in a diabetic could not be made, but it is still uncertain. The data clearly shows that most diabetic patients have a co-existing diagnosis of dyslipidemia. This makes it difficult to ascertain if statin therapy is being used only for the dyslipidemia diagnoses or in addition as a primary prevention strategy. Lab values were not evaluated in this study to see if dyslipidemic patients that were not on a statin were within normal limits through other measures such as diet and exercise. Only 2 out of 6 patients that were on a medication for dyslipidemia, other than a statin (e.g., fish oil, colestipol, and Zetia)

provided a rationale against a statin. Nearly one-third of the sampled diabetic population were not on statin therapy. Furthermore, only one patient had diabetes listed as a rationale in the medication template; and one patient that was on a statin had no rationale listed for its use.

Evidence-based guidelines are useful only if the knowledge contained in them is translated into clinical practice. "Primary prevention measures are underused in general practice" (AHA/ASA, 2011). Barriers that might attribute to this could be the patient's: perceived susceptibility, cost-benefit, lack of insurance, lack of knowledge of stroke risk, and noncompliance (AHA/ASA, 2011; Holloway, Benesch, & Rush, 2000). The public's perception of prevention services are also found to be utilized less due to not having an immediate observable outcome (Holloway et al., 2000). In addition to these patient barriers, providers themselves may lack current knowledge of the evidence-based practice guidelines for the prevention of stroke and the management stroke-risk factors (Holloway, Benesch, & Rush, 2000).

Limitations

The limitations in this study were few, but notable. Due to time-restraints each provider note for every patient/every visit for the inclusion dates could not be extracted for rationales. These rationales may include education of patient for stain therapy or why the provider thought statin therapy was or was not needed.

Since the data were collected only from the patient's active medical problem and active medication lists, rationales were unable to be obtained; unless the provider included the reason for the statin in the medication prescription template.

Therefore, a rationale could not be found against treatment for patients who were not on statin therapy. However two patients on Zetia had "statin-intolerance" listed for reason within the prescribing medication template.

In collecting the data several errors were found entered on patient's height. Differing heights were entered on many patients at each visit (ranging from 5 to 7 ft on the same patient), making it difficult to obtain an accurate BMI. In addition, some patients were on a hypertensive medication (e.g., Lisinopril-Hydrochlorothiazide) but had no listing diagnosis of hypertension. Therefore, incorrect data entry and lack of entry from ancillary staff as well as providers must be considered. In March 2013, the Ambulatory Electronic Health Record (AEHR) was introduced to the clinic. This may have attributed the electronic records being incomplete from conversion from paper to electronic format.

Lastly, a provider focus group was scheduled to submit the findings of the retrospective chart review and to assess the facilitators and barriers in adhering to the primary stroke prevention guidelines, but was unfortunately cancelled due to circumstances beyond the primary investigator's control.

Implications for Practice

It has been shown that (a.) diabetics have a higher risk of stroke, (b.) diabetics have a higher risk of dyslipidemia, and (c.) women have a higher risk of metabolic syndrome and stroke (AHA/ASA, 2011; AHA, ASA, 2014; Air & Kissela, 2007; CDC, 2011; Colhoun et al., 2004; Cheung et al., 2004; De Vries et al., 2012; Heart Protection Study, 2002; Hewitt et al., 2012; Karsito, 2008; Kearney, et al. 2008; Lakhan et al., 2010; Page et al., 2012). The obligation towards protecting

women against disability and death from stroke is of great magnitude. To date there is only one guideline specific to primary stroke prevention and specific to women. Further research is needed to protect women with diabetes from stroke.

Evidence has been delivered and recommendations made to provide all diabetics, (especially women who are at higher risk) primary prevention against stroke with statin therapy.

All adult individuals should be knowledgeable of stroke and stroke risk factors, especially women who are at higher risk. In conjunction with providing important personal health maintenance, the primary healthcare provider should seek to identify specific risk factors, educate their patients in ways to reduce these risks, and advise therapeutic interventions as warranted based on the AHA/ASA guidelines. An aggressive approach to screening, establishing the presence of specific stroke risk factors, and intervening will reduce the prevalence of first stroke. In turn, reducing its calamitous consequences that plague our society and contribute to the rising costs of healthcare.

The importance of modeling and introducing a clinical practice guideline aimed at reduction of first stroke in women cannot be over estimated. The importance lies in the potential to individually and publically integrate, in an efficient and effective manner, the evidenced based clinical guidelines established by the AHA/ASA, and to promote awareness of the ability to reduce primary stroke incidence while better managing control over modifiable stroke risk factors.

Evidence-based guidelines are ineffective if unable to be applied to practice. One of the main roles of the primary care provider (PCP) is health promotion and

disease prevention. The PCP is responsible for being up to date on the latest evidence-based treatment and prevention techniques. The PCP should make efforts to improve stroke prevention practices individually and identify and treat stroke risk factors in all patients, regardless of presenting illness (Holloway, Benesch, & Rush, 2000). The translation of evidence-based guidelines may prove difficult for many reasons. Holloway, Benesch, and Rush, (2000) state the, " the goal is to create a supportive practice environment to provide cues, resources, and support to promote desired behavior change". Providers can increase stroke awareness and prevention strategies among their patients in several ways; educational materials around office, waiting rooms, and exam rooms; using computerized chart remainders; patient flow-sheets; office policies emphasize stroke screening in all patients; post-card reminders; and being familiar with community services (AHA/ASA, 2011; Holloway et al., 2000). The strategy that had the best outcome in cardiovascular risk reduction measures was computer based clinical reminders, when compared to a control (AHA/ASA, 2011). "Passive dissemination of information, as in publishing guidelines or traditional CME courses, are generally ineffective and at best results only in very small effects on physician practices" (Holloway et al., 2000). A variety of active prompts and office strategies are needed to ensure the best chance of provider adherence to guideline recommendations (Holloway et al., 2000). The data of this inquiry project will be disseminated to the providers of the reviewed clinic at a later date. Recommendations of computer-based prevention reminders will be suggested, if not already utilized.

Clearly, more research is needed to identify feasible strategies to improve the dissemination and application of evidence-based stroke prevention guidelines. The goal will be to create a universal tool to improve identification of stroke risk factors, interventions needed, and measured adherence.

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Appendix A

Pt. #	Hysterectomy
Age	HRT
Race	Age of Menopause
Insurance	Statin
Smoker	Rationale For Statin
Alcohol	Rationale Against Statin
BMI	Medication #1
Systolic BP	Medication #2
Dystolic BP	Medication #3
Diabetes Type 1	Medication #4
Diabetes Type 2	Medication #5
Hypertension	Medication #6
A-fib	Medication #7
Dyslipidemia	Medication #8
Previous CVA	Medication #9
Previous TIA	Medication #10
MI	Medication #11
PVD	ICD-9 #1
CAD	ICD-9 #2
CABG	ICD-9 #3
Stenosis of Any Atery	ICD-9 #4
Circulation Problems	ICD-9 #5
Migraine with Auras	ICD-9 #6
Menopause	

Figure 1

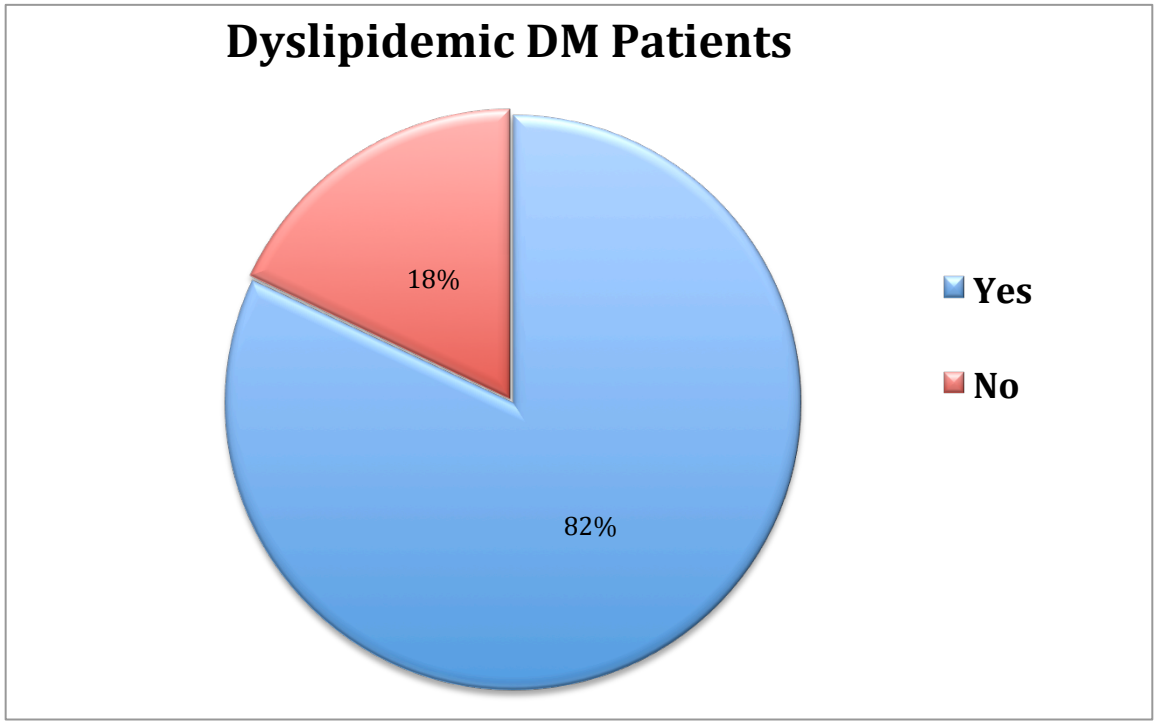
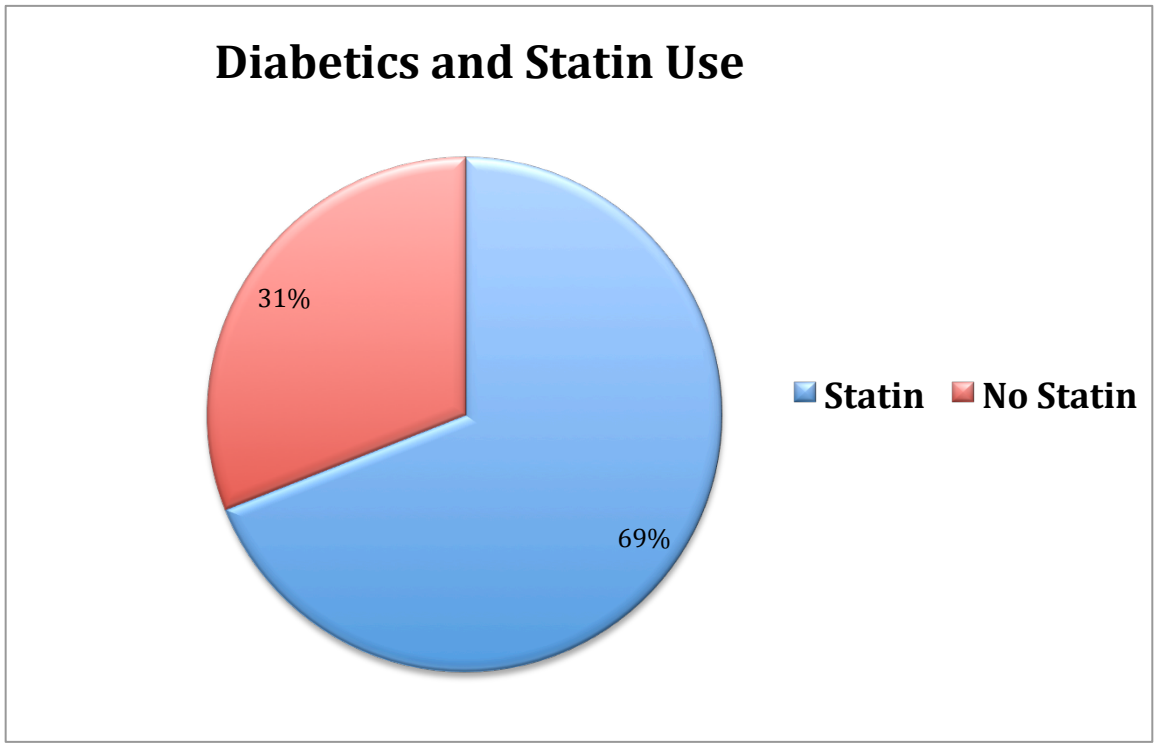


Figure 2



- **Out of the sample of 100 Diabetic Patients:**
  - **82% had a diagnosis of dyslipidemia**
  - **Only 69% were on a prescribed statin**

Figure 3

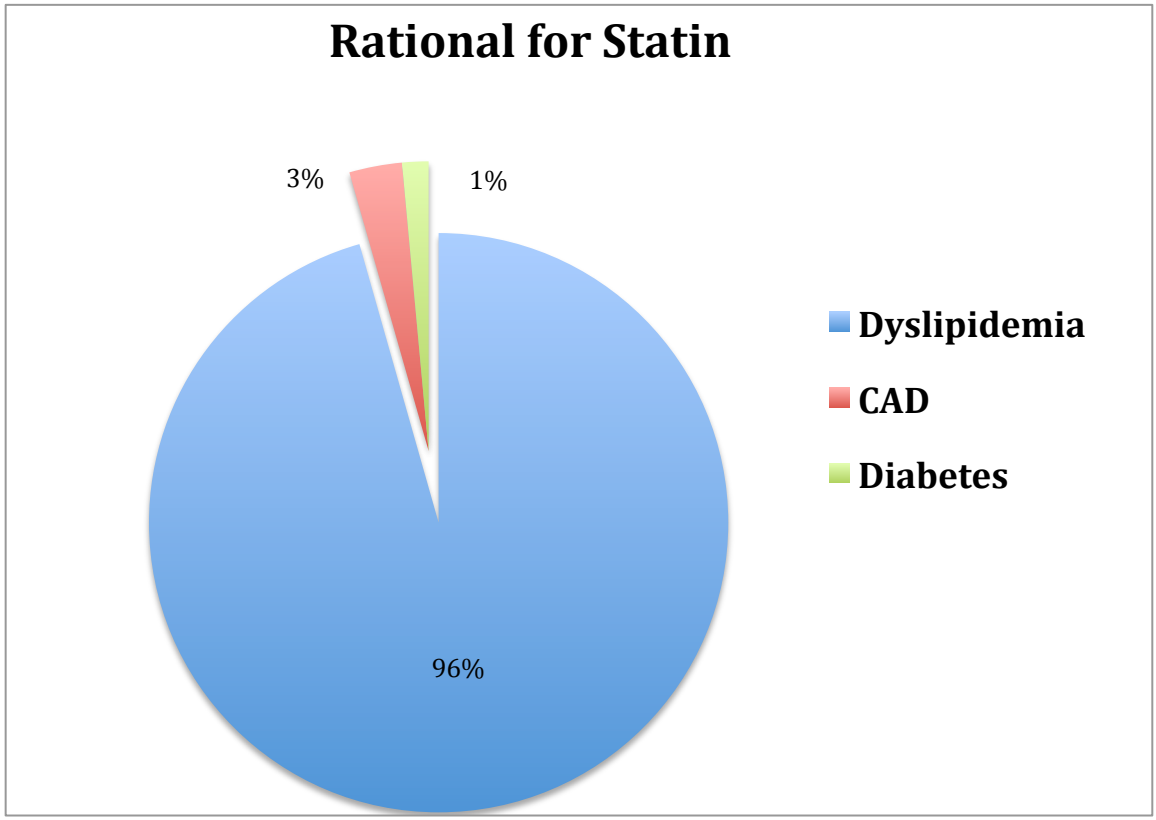


Figure 4

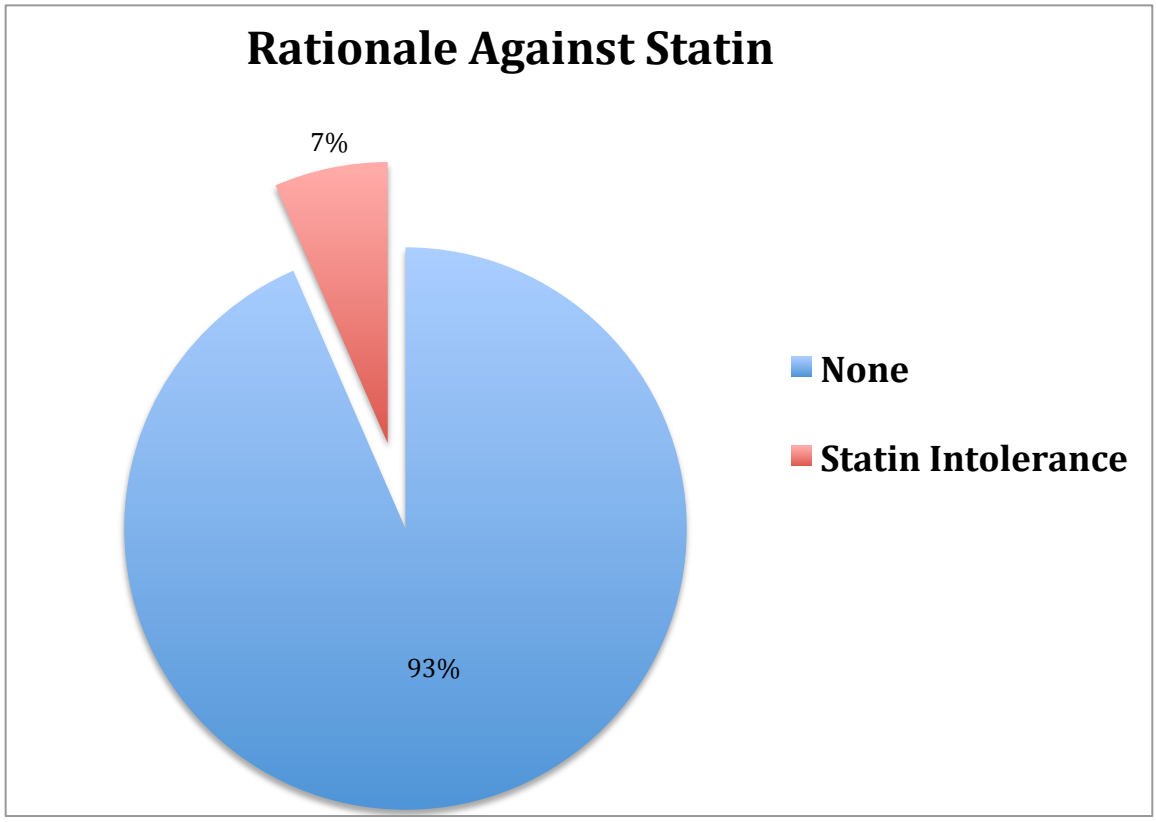
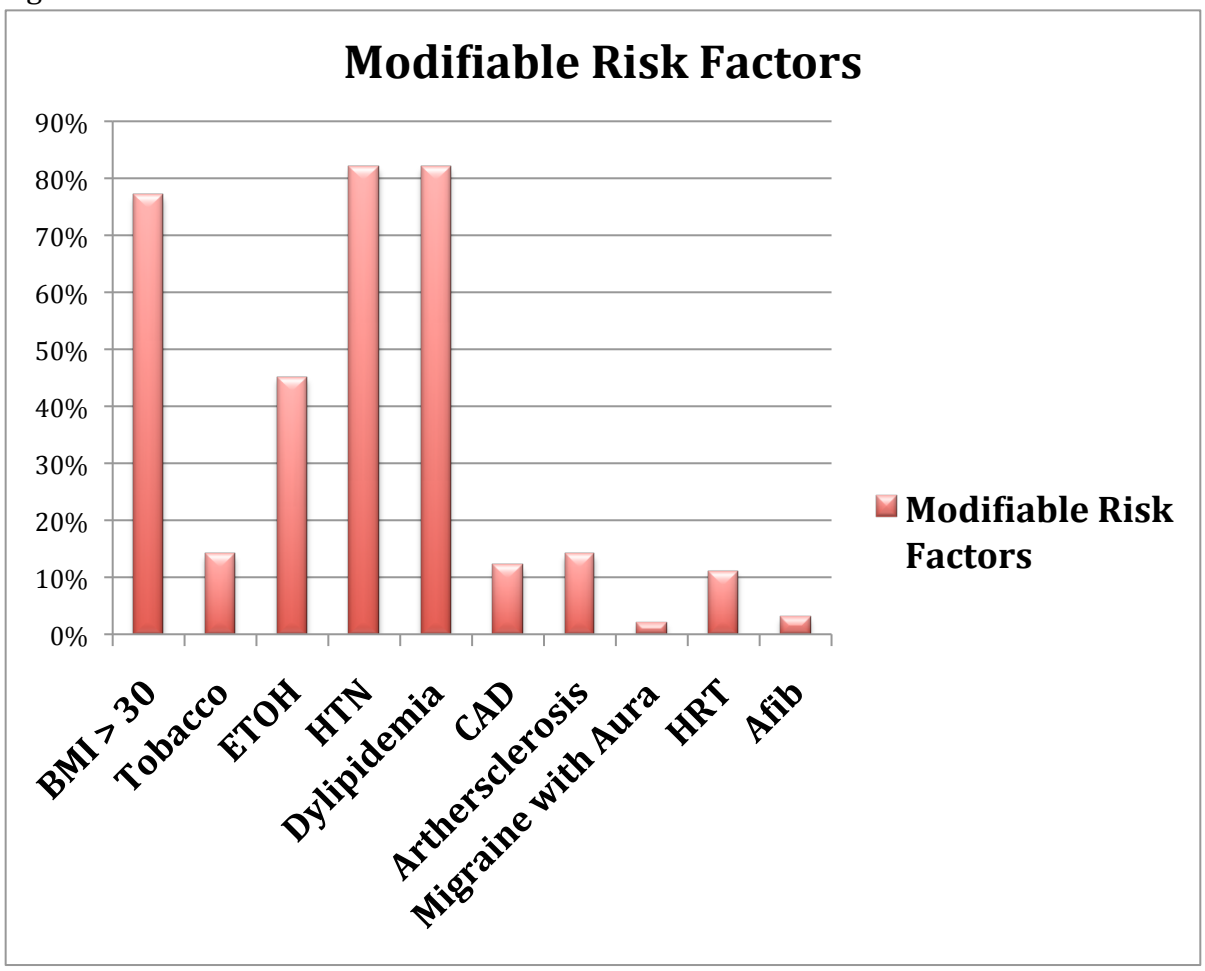


Figure 5



Capstone Conclusion

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Conclusion

The factors influencing, preventing and treating stroke is multi-focal and require further study and implementation to reduce its prevalence and dismal consequences.

As the first manuscript describes, stroke knowledge is markedly limited. Failures in patient knowledge of risk factors and recognition of stroke symptoms have impact on stroke occurrence and pre-hospital delay in seeking treatment. Although evidence-based guidelines for identification and treatment of stroke risk factors have been published, dissemination of this information into the public sphere has been lacking. Appropriate and successful educational medium(s) to impart this information remains problematic. The educational interventions that demonstrated the most effective approaches in accomplishing a reduction in stroke rate and improvement in acute interventions were; intense individual counseling (at an early age if possible); and a much broader scope of mass media. Generic public educational tools, e.g., written materials, surveys and posters, were found to be much less effective and limited in scope. Any educational tool must be predicated on a thorough evidence-based knowledge of stroke as well as an understanding of the socio-economical and psychological environment, contingent attitudes, opinions, and behavioral patterns of the targeted audience.

The second manuscript detailed a critical analysis of the AHA/ASA (2014) Clinical Practice Guideline for The Prevention of Stroke in Women, using a modified version of the Appraisal of Guidelines for Research and Evaluation (AGREE) Instrument (2001). Women have been found to have a higher overall prevalence

and mortality associated with stroke than their male counterparts. All adult individuals should be knowledgeable of stroke and stroke risk factors, especially women. In conjunction with providing important personal health maintenance, the advanced practice nurse should seek to identify specific risk factors, educate their patients in ways to reduce these risks, and advise therapeutic interventions as warranted based on the AHA/ASA guidelines. An aggressive approach to screening, establishing the presence of specific stroke risk factors, and intervening will reduce the prevalence of first stroke.

The final manuscript detailed the results of a descriptive study, examining provider adherence to prescribing a statin to all diabetic patients for primary prevention of stroke, regardless of dyslipidemia. This study took place in a women's primary care clinic. Evidence has been delivered and recommendations made to provide all diabetics, (especially women who are at higher risk) primary prevention against stroke with statin therapy.

In summary, it has been shown that stroke knowledge is lacking despite high stroke prevalence. Women and diabetics are at an increased risk for stroke and primary statin therapy can be used among the diabetic population for reduction in first stroke. The importance of these findings lies in the potential to individually and publically integrate, in an efficient and effective manner, the evidenced based clinical guidelines established by the AHA/ASA, and to promote awareness of the ability to reduce primary stroke incidence while better managing control over modifiable stroke risk factors. The obligation towards protecting women against disability and death from stroke is of great magnitude.

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