Increasing Stroke Knowledge Among Fifth Graders Using an Educational School-Based Intervention

INCREASING STROKE KNOWLEDGE AMONG FIFTH GRADERS USING AN EDUCATIONAL SCHOOL-BASED INTERVENTION

by

Yeimi Ines Rivera

A DNP Project Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF NURSING PRACTICE

In the Graduate College

THE UNIVERSITY OF ARIZONA

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THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Yeimi Ines Rivera entitled "Increasing Stroke Knowledge Among Fifth Graders Using an Educational School-Based Intervention" and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

Leslie Ritter, PhD, RN, FAAN, FAHA — Date: November 20, 2017

S. Renee Gregg, DNP, FNP-C — Date: November 20, 2017

Gloanna Peek, PhD, RN, CPNP — Date: November 20, 2017

Final approval and acceptance of this DNP project is contingent upon the candidate's submission of the final copies of the DNP project to the Graduate College.

I hereby certify that I have read this DNP project prepared under my direction and recommend that it be accepted as fulfilling the DNP project requirement.

DNP Project Chair: Leslie Ritter, PhD, RN, FAAN, FAHA — Date: November 20, 2017

STATEMENT BY AUTHOR

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SIGNED: __Yeimi Ines Rivera_____

ACKNOWLEDGMENTS

To begin, I would like to extend my deepest gratitude to my committee chair, Leslie Ritter, PhD, RN, FAAN, FAHA, for your guidance, enthusiasm, and encouragement throughout my doctoral education. I appreciate your unique ideas, for challenging me to think outside the box, your honesty, and for your dedication and commitment towards both advancing nursing as a profession as well as contributing to the current nursing literature. Additionally, without your support and expertise my doctoral research project conducted in a subject area I am deeply passionate about could not have been achievable. I would also like to extend gratitude to my other committee members Renee Gregg, DNP, FNP-C, and Gloanna Peek, PhD, RN, CPNP, for your time, guidance, expertise, and your genuine interest and contributions in making my DNP project possible.

I would also like to thank my family especially my loving and incredible husband Sean. I sincerely thank you for your unwavering support and encouragement throughout my graduate studies. Thank you for believing in me (even when I didn't), for being my model patient, my sound board, my greatest fan, and celebrating even the smallest victories along the way. My dream of becoming a Family Nurse Practitioner could simply not have been achievable without your love, compassion, patience, and physical/emotional support.

To my parents, Rafael and Ines Carmona thank you for instilling the importance of education, hard work, and for always encouraging me to pursue higher education. I am forever indebted to the both of you for providing my undergraduate nursing education and therefore, allowing me to pursue graduate school without too much financial strain. I appreciate your genuine interest in how my classes and clinicals were going as well as how my project was developing. To both my brothers Rafael and Elvin Carmona for your love, support, and interest in my studies as well. I love you all.

Finally, I would like to acknowledge my friend and colleague Mrs. Julia Cyr for your help, motivation, and ongoing friendship that made this program survivable! Your kindness, compassion, and ability to stay cool, calm, and collected—have been so helpful! Thank you and good luck with your future endeavors.

DEDICATION

I dedicate this project to my lovely mother Ines L. Carmona, as she was the reason I entered the healthcare field. Unfortunately, she suffered a stroke at the young age of 60 and was taken from me too soon in life. She was one of the strongest, most compassionate woman I have ever known. She is the one who taught me the value of hard work, dedication, and sacrifice. She also gave and taught me the importance of unconditional love. Thank you for always encouraging me to be the best version of myself and for helping me develop patience, compassion, and to do all things with love. I know you are proud and are always with me.

I love and miss you dearly Mom.

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ABSTRACT

BACKGROUND: In America, stroke is the fifth leading cause of death taking more than 130,000 people every year. Early recognition is imperative as survival increases with prompt intervention. Unfortunately, many Americans including children do not know the acute signs and symptoms of stroke, especially those in high-risk communities. Due to the significance surrounding the public health burden of stroke, the purpose of this project is to evaluate a time efficient, mobile device supported stroke education program for fifth graders and their parents who live in a multi-ethnic community. DESIGN: This DNP project implemented a prospective descriptive study. SETTING: The study took place at a local public elementary school in Phoenix, Arizona within a multiethnic community with predominately Hispanic children. DATA COLLECTION: The data was collected in the form of pre and post-tests from the fifth grade students. Surveys were also given to parents and the teacher. RESULTS: Results from 19 students indicated fifth graders can learn about stroke, recognize the early warning signs, and seek help fast. Data from parental surveys, indicated students talked to their parents about what they learned and shared the stroke phone app with them. The study also found a positive teacher perception of incorporating technology-supported stroke lesson into fifth grade curriculum. CONCLUSION: This study found increasing stroke knowledge among fifth graders using a novel mobile technology supported school-based intervention is possible and, in fact, found students shared the information and stroke application with their parents and families at home. Findings also support the need for continual research on educating today's youth, targeting high-risk populations, and further fine-tuning this sustainable stroke knowledge program for middle schools across Arizona.

INTRODUCTION

Cardiovascular disease and stroke cause a large health and economic burden in the United States and worldwide (Mozaffarian et al., 2016). Stroke is the fifth leading cause of death killing more than 130,000 Americans every year (Centers for Disease Control and Prevention [CDC], 2016). Early recognition of stroke symptoms is imperative because the chances of survival are increased when emergency treatment begins quickly. Unfortunately, many Americans are not aware of all stroke symptoms and thus, emergency treatment can easily be delayed (CDC, 2016). To illustrate the lack of knowledge, a recent survey by the CDC (2016) showed 93% of respondents only recognized one symptom of stroke, sudden numbness and only 38% were aware of all major stroke symptoms (facial drooping, unilateral weakness, slurred speech, confusion) and knew to activate the emergency system promptly. In a similar population-based research study by Schneider et al. (2003) on public awareness of stroke, found only 70% of adults could name a single stroke warning sign. Given the morbidity and mortality rates associated with stroke in the US, an increase in stroke knowledge is inherently needed.

Background Knowledge

Every year more than 795,000 people in America have a stroke (CDC, 2016). Initial strokes number 610,000 of those cases, about 185,000 occur in people with previous strokes (CDC, 2016). Every 40 seconds, on average, someone in the United States falls victim to a stroke and every four min a stroke victim dies (Mozaffarian et al., 2016). Stroke is also the leading cause of long-term disability in America and reduces mobility in more than half of survivor's 65-years and over (Steiger & Cifu, 2016). The CDC (2016) reports African Americans, American Indians, and Alaska Natives are at highest risk of having a stroke, followed by Hispanics and

Caucasians. Risk factors include advancing age, high-blood pressure, high cholesterol, and smoking (CDC, 2016). Strokes costs the United States over $33 billion each year in health care costs, medications, and missed days of work (CDC, 2016). Given the incidence and prevalence of stroke, it causes a significant health and economic burden in America.

Approximately 87% of all strokes are ischemic strokes often caused by blood clots that prevent blood flow to the brain (CDC, 2016). Currently, intravenous fibrinolysis, or IV alteplase (recombinant tissue plasminogen activator [r-tPA]), is the only approved treatment by the Food and Drug Administration (FDA) for ischemic strokes, but it needs to be administered within three-hours of symptom onset as long as the patient meets inclusion criteria (Jauch et al., 2013). Treatment with r-tPA is associated with favorable neurological outcomes as found in a large two-part NINDS r-tPA Randomized Controlled Stroke Trial (Jauch et al., 2013). Results of the study found impressive results in individual functional measures with the administration of fibrinolysis therapy which includes: global disability (40% versus 28%), global outcome (43% versus 32%), activities of daily living (53% versus 38%), and neurological deficits (34% versus 20%) (Jauch et al., 2013). Based on the NINDS r-tPA Stroke Trial, the U.S. FDA approved the use of intravenous r-tPA in 1996 (Jauch et al., 2013). Stroke patients treated with r-tPA have a 30% chance of having no disability compared to those not receiving the medication in time (Kwiatkowski, Libman, & Frankel, 1999). Not only is r-tPA found to be an effective treatment, but it also lowers healthcare cost as patients that receive the treatment often discharge home rather than to nursing homes or rehabilitation centers (Fagen et al., 1998). However, only a small percentage of ischemic stroke patients receive r-tPA treatment (Brown, Lisabeth, Garcia, Smith, & Morgenstern, 2004). A major barrier to receiving r-tPA treatment is being outside the defined

three-hour window, which can be attributed to the lack of recognizing stroke signs and symptoms and activating emergency services early on (Conley et al., 2010). Increasing the general public's stroke awareness can help to mitigate this significant problem and improve stroke outcomes.

Considering children are usually with their parents or with adults, increasing children's knowledge about stroke signs and symptoms and what to do when witnessing an acute stroke is of great value to the community. By improving children's knowledge of stroke symptoms, it increases the pool of individuals in the community capable of recognizing stroke symptoms and activating emergency services. This may result in stroke victims being assessed and treated within the time frame for fibrinolytic therapy. Therefore, in order to improve stroke treatment and outcomes, the public including children, need to be educated on the stroke signs and symptoms and must know to promptly activate emergency services when witnessing a suspected stroke.

According to Piaget's Stages of Cognitive Development, school-aged children (ages 7-11) are considered concrete operational thinkers and this stage is considered a major turning point in a child's development (McLeod, 2015). Children in this stage begin to think more operationally or logically, are able to maintain an external point of view, and problem solve internally (McLeod, 2015). Additionally, school-aged children are considered to be in the Preconventional-Conventional Moral development stages according to Kohlberg's Three Levels and Six Stages of Moral Reasoning (McDevitt & Ormrod, 2010). Children in the Preconventional-Conventional Moral Stage try to satisfy other's needs, continue to define what is considered right versus wrong, make decisions mostly to please others, are concerned about

maintaining relationships, and take others perspectives into account (McDevitt & Ormrod, 2010). Based on school-aged children's development, they are a prime age group to target health related education.

Local Problem

In communities at high risk for stroke, knowledge of stroke symptoms and the importance of calling 911 is low among both children and adults with the lowest level of knowledge reported in Hispanic Americans and Spanish-only speaking Hispanic Americans (Williams et al., 2012; DuBard, Garrett & Gizlice, 2006). This presents a significant problem in Southeastern Arizona as the Hispanic population in Arizona is the sixth largest in the nation (Morrison Institute for Public Policy, 2010). Approximately 2.1 million Hispanics reside in Arizona accounting for 31% of Arizona's total population (United States Census Bureau, 2015). Additionally, almost half of the Arizona population is made up of minorities who are also considered at high risk for stroke; while the other half are Caucasian (Morrison Institute for Public Policy, 2010).

Within the last 10 years, a handful of studies have been done to increase stroke knowledge among school-aged children with impressive results. Specifically, school-based stroke education interventions were found to be effective to improve knowledge of stroke in children from kindergarten to junior high (Beal, Flanders, & Bader, 2016). However, few studies have targeted improvements in stroke knowledge among Hispanic children. A large multi-ethnic randomized control study by Conely et al. (2010), implemented a school-based stroke education program with the purpose to increase knowledge of stroke in sixth, seventh, and eighth graders in Corpus Christi, Texas. The Conley et al. (2010) study targeted a multi-ethnic school and

implemented culturally relevant information directed at the Mexican American culture, and also incorporated homework for adult partners or parents to be involved. The study was found to increase stroke knowledge in children compared to the control group, however, too few adult partner post-tests were returned to provide meaningful results (Conley et al., 2010). A similar randomized control study done by Morgenstern et al. (2007) where the participants were majority Hispanic found similar results; improvements in stroke knowledge of sixth, seventh, and eighth graders, but with not enough data from the parents to analyze. A third novel study conducted by Williams, Hecht, DeSorbo, Huq, and Noble (2014) with majority Hispanic participants, found significant improvements in stroke symptom composite scores and calling 911 by using a stroke educational video game in fourth and fifth graders. In summary, school-based interventions are effective to improve stroke knowledge and stroke symptoms in children, but are they sustainable?

An exponential growth in the use of phone applications is noted worldwide as a source of valid and updated health information (Dubey, Amritphale, Sawheny, Amritphale, Dubey, & Pandey, 2014). Smartphone applications are quickly becoming novel platforms for healthcare related information and are becoming a reliable source of healthcare information for both healthcare providers as well as the general population (Dubey et al., 2014). Currently, there are an abundance of stroke education material that can be used on mobile phone devices; over 93 phone applications exist on the content of stroke, half of which are aimed for general public use (Dubey et al., 2014). One of those applications includes the American Heart Association (AHA) and the American Stroke Association (ASA) “Spot a Stroke FAST” mobile phone application available for free download in English and Spanish. The quick, simple “Spot a Stroke FAST”

application includes how to recognize a stroke fast and can be easily understood and navigated by children with mobile phones. In a Massachusetts research study by Englander (2011), surveying more than 20,000 students found: 90% of children are playing games online by the third grade, more than 20% of third graders have their own cell phone; by the fourth grade 26% have a cell phone, and by the fifth grade 39% have a cell phone in elementary school. The statistics confirm young children, even as young as third grade, are comfortable using smart phone mobile technology.

The stroke mnemonic "FAST" ("F" for "Face Droop," "A" for "Arm weakness," "S" for Speech affected/slurred, and "T" for "Time to call 911") developed by the Cincinnati Prehospital Stroke Scale will also be incorporated into the program (Kothari, Pancioli, Liu, Brott, & Broderick, 1999).

In summary, studies to date indicate that children of different schools, age groups, varying ethnicities, and diverse teaching modalities can learn and retain stroke knowledge and that family learning can occur while students learn. However, while yielding valuable information, the studies conducted so far are complex and require a great deal of classroom time, and thus, are not likely sustainable given the curriculum requirements and demands of the classroom. We also know that school-age children are acculturated in the use of mobile devices for learning. Currently, there are no studies describing the practicality of using time efficient, mobile device-based supported stroke education program for school age children.

Purpose

Due to the significance surrounding the public health burden of stroke and to address this gap in school-based stroke education, the purpose of this project is to evaluate a time efficient,

mobile device supported stroke education program for fifth graders and their parents who live in a multi-ethnic community.

The specific objectives are to determine if time-efficient mobile device supported stroke education: 1) increases stroke knowledge (including pathophysiology, symptoms, and treatments; 2) increases intent to call emergency services upon witnessing an acute stroke event; 3) if students discuss the mobile phone application, "Spot a Stroke FAST" by the American Heart Association (AHA) and American Stroke Association (ASA) with their parents/caregivers; and, 4) if the parents will participate in stroke survey. Lastly, the study will explore the fifth grade teacher's perceptions of the likeliness of incorporating the stroke education program into their curriculum.

Stakeholders play an important role in implementing and sustaining school-based educational health promotion programs and including the right members is key to success. To enlist an effective team, three different kinds of expertise within the school's organization should be included: systems leadership, technical expertise, and day-to-day leadership (Institute for Healthcare Improvement [IHI], 2016). To represent systems leadership, the school board and principal will be involved as they can indirectly influence curriculum. A technical expert is the nurse practitioner who is well versed in health promotion. Day-to-day leadership includes the fifth grade classroom teacher as they are experts in education and developmental stages. Other key stakeholders include the students and a parent as they can both serve as champions of intervention as well as initial adopters.

Study Questions

The study questions reflect the specific objectives: After completing the time efficient mobile device supported stroke education program: 1) Will stroke knowledge (including pathophysiology, symptoms, and treatments) in fifth graders increase? 2) Will fifth grader intent to call '911' increase? 3) Will fifth grader conversation about stroke occur with their families using mobile phone technology? 4) Will parents take part in an educational stroke survey? 5) Will the fifth grade teacher have a positive perception of the stroke educational intervention?

FRAMEWORK AND SYNTHESIS OF EVIDENCE

Theoretical Framework

The theoretical framework that will guide this DNP Project is the Social Learning Theory (SLT) by Albert Bandura. The SLT explains how people learn and combines classic behaviorist learning theories with two important ideas: observational learning and the mediational process or cognitive thinking behind learning (McLeod, 2016). Social learning theory explains individuals not only learn through experiences or directly, but can also learn indirectly through observation. Observational learning can occur through imitation, identification, modeling, and vicarious reinforcement (McLeod, 2016). However, an individual does not just "see and do," there is a thought process that occurs and SLT captures that mediational process and describes it within four concepts: attention, retention, reproduction, and motivation (McLeod, 2016). Therefore, the SLT provides a comprehensive view of human learning by incorporating the role of mediational processes within learning. This theory can help researchers identify and develop appropriate interventions to promote learning and increase knowledge. Moreover, the SLT model is

important in guiding research because if the process of learning is better understood, interventions that are more effective can be implemented to increase knowledge.

Concepts

Understanding the four concepts of the mediational process of SLT is important when preparing the stroke lesson for the students in the classroom. The first concept of mediational processes proposed by Bandura is attention; in order for a behavior to be imitated, it has to grab the person's attention (McLeod, 2016). Retention is the second concept and describes to how well the behavior is remembered (McLeod, 2016). Retention is a key component in the lesson to encourage the children to remember the concepts of stroke readiness in order to reproduce an actionable response when witnessing an acute stroke. Reproduction, the third concept, is the ability to perform the behavior; this influences the decision of whether or not the individual actually tries the learned behavior (McLeod, 2016). Finally, motivation is the will to perform the behavior, and rewards as well as punishments highly influence motivation (McLeod, 2016). Incorporating these concepts into the project's intervention can increase the success and sustainability of the stroke lesson.

Synthesis of Evidence

Several school-based stroke programs have shown efficacy in improving stroke awareness and knowledge in children. In a large randomized controlled three-year prospective trial by Conley et al. (2010), students in the intervention group had significant improvements in their stroke awareness scores compared to pre-test scores; whereas students in the control group showed improvement as well but not as significant. Conely et al. (2010) also looked at parental learning but had too few adult post-tests returned to provide meaningful results. In a similar

study in Japan by Ishigami et al., (2017), both children and their parent's rate of correct answer for stroke symptom recognition at three months was higher compared to pre-test scores indicating stroke education was being conveyed to parents from their children. Another study by Amano et al. (2014) had similar findings as the cross sectional study with junior high school students found both students as well as their parents had increases in stroke knowledge, also validating parents can be educated by their children. Additionally, Amano et al. (2014), concluded "school-based interventions with our homemade items of stroke enlightenment are beneficial for junior high school students and [are] promising means for delivering the stroke message to their parents" and also promotes a healthier lifestyle from a young age, possibly resulting in the primary prevention of cardiovascular disease in the future. Williams et al., (2014), found 9 to 10-year-old students in low income neighborhoods could improve actionable stroke knowledge by playing a novel video game on stroke knowledge and that information could be retained greater than seven weeks. A pilot study by Miller, King, Miller, and Kleindorfer (2007) not only found increases in the middle school students' stroke readiness from pre-test to post-test, but also discovered the program positively influenced the children's attitudes toward stroke and self-efficacy and empowered them to make changes to their health behaviors to improve their overall health.

A synthesis of the evidence indicates school-based educational stroke programs are effective in improving stroke knowledge and stroke symptom recognition among children between the ages of 9-15 years old, regardless of the educational program or program length (Beal, Flanders, & Bader, 2016). Additionally, two studies showed statistically significant increases in parental knowledge of stroke and symptom recognition indicating the transfer of

knowledge to parents from their children is possible (Beal, Flanders, & Bader, 2016). Despite these impressive findings, my research indicates no studies to date have implemented sustainable school-based interventions given curricular requirements and teacher demands. Evidence from a systematic review assessing school-based stroke education interventions, suggest single-session interventions may be as effective as longer interventions and simpler interventions are less burdensome to the school and thus, more sustainable (Beal, Flanders, & Bader, 2016). Further, more studies are needed to mitigate the knowledge deficit within the Hispanic population in Phoenix, Arizona as this population has higher stroke rates than Caucasian individuals and stroke literacy is low (Beal, Flanders, & Bader, 2016). Moreover, "The projected rise in stroke prevalence will disproportionately affect minorities, particularly Hispanics, whose population growth will substantially outpace other population groups in the coming decades" (Beal, Flanders, & Bader, 2016, p. E11). These statistics reinforce the need to improve the number of minorities who go to the emergency room in a timely manner to be eligible for r-tPA administration (Beal, Flander, & Bader, 2016). Therefore, by implementing school-based stroke education in high-risk communities with a high prevalence of Hispanic minorities has the potential to expand the number of individuals capable of recognizing and responding to acute stroke symptoms.

METHODS

Design

This DNP project used a prospective descriptive study to determine if a school-based intervention supported by a stroke phone application increases stroke knowledge and is

sustainable within a fifth grade classroom. The study used student pre- and post-tests as well as parental and teacher surveys.

Setting

The setting took place at a local public elementary school in Phoenix, Arizona with predominately Hispanic children. An elementary school was chosen to align with purpose of this DNP project to implement a school-based intervention. Additionally, the school was a convenient place to reach the targeted population fifth grader students and their parents. The researcher worked with the classroom teacher to coordinate the stroke education took approximately 45 minutes of time. Site approval from the school principal, school district, and school teacher were all obtained.

Participants

The targeted population included fifth grade students from one classroom, their parents, and the teacher. A maximum of 60 people (30 students, 31 adults) were projected to be included in this study if all students, a parent/legal guardian, and one teacher chose to participate. The participants were selected using convenience sampling. Convenience sampling uses the first available primary data source without any additional requirements (Dudovskiy, 2017); meaning all the students within the fifth grade classroom are invited to participate. Advantages to convenience sampling include simplicity of sampling, short time frame for data collection, and minimal costs (Dudovskiy, 2017). Possible disadvantages of convenience sampling include vulnerability to selection bias, high level of sampling error, and potential for little credibility (Dudovskiy, 2017). Criteria for inclusion for this study include: (a) fifth grade children from a

public school with predominately Hispanic students, (b) between 9-12 years old, (c) and their parents.

Intervention and Data Collection

After receiving Institutional Review Board (IRB) approval (Appendix A), the study implemented a 45-minute stroke education program within one fifth grade classroom. The educational program is adapted from the Retreat & Refresh Stroke Camp®, a non-profit organization dedicated to supporting stroke survivors and their caregivers (www.strokecamp.org). In addition to providing community activities such as weekend retreats ("camp") they provide community stroke education. The stroke education program for fifth graders is available free of charge to the public or researchers (personal communication, Larry Scherer, Chair of the Board).

The study was conducted during the student's routine classroom day and lasted approximately 45 minutes. The primary investigator conducted all classroom activities during the intervention with some assistance from the teacher. The intervention began with a brief introduction and obtaining child assent (three minutes) (Appendix B). Child assent was documented by having the students sign their names on a sign-in sheet (Appendix C). A pretest for the students followed (five minutes). After the pre-test, a short lecture on stroke pathophysiology, stroke symptoms, and what to do when witnessing a stroke was given (seven minutes). Following the lecture, the stroke mnemonic "FAST" ("F" for "Face Droop," "A" for "Arm weakness," "S" for Speech affected/slurred, and "T" for "Time to call 911") was reviewed (Kothari, Pancioli, Liu, Brott, & Broderick, 1999) and students were led through uploading the FAST app on their phones (eight minutes). If a child did not have a phone, they either shared

with a friend, or reviewed it on one of the three researchers' personal iPad's that were brought into the classroom. Additionally, if phones were not allowed in the classroom, all the students would have written instructions at a fifth grade reading level on how to download the phone application onto their phones outside of the classroom and have time to review the app on one of the researchers personal IPads. Following the FAST instructions, a quick review of stroke treatment and prevention was given (three minutes) as well as a question and answer session, and homework review (eight minutes). The students were given the homework packet that includes a picture of the brain, a coloring page, instructions on how to download the phone app, a letter to the parents, as well as the parental survey to take home (Appendix D & E). The parental survey determined if the child talked to them about stroke, if they understand stroke symptoms, what to do if they witness stroke, and if they downloaded the FAST phone application (Appendix F). Students were instructed to bring the parental survey back the next day for a small prize (a pencil and an eraser in the shape of a brain). The lesson ended with a game that emphasizes stroke symptoms. The questions will be the following: "1) Who can tell me a stroke sign? 2) Who can tell me what a stroke is? 3) What do you do if you think someone is having a stroke? 4) What does the F in FAST stand for? 5) What does the T stand for?" (five minutes) and students were given a stress ball in the shape of a small brain for participation. At the end, all the students received the stress ball regardless of participation. Lastly, a post-test was given to the students (five minutes). A Likert-type survey was also given to the fifth grade classroom teacher to assess their willingness to utilize the stroke materials in her classroom and willingness to use mobile phone technology for educational purposes. This survey assessed the outcomes, practicality, and usability of the stroke educational materials.

Tools for Data Collection

Data was collected from students, from their parent/legal guardian, and from the teacher. The data from the study was collected in the form of pre-tests and post-tests. The pre-test and post-test quizzes for the fifth grade students were adapted from the non-profit organization Retreat & Refresh Stroke Camp® and included 10 true or false questions (Appendix G & H). The tests took approximately five minutes to complete. The parental survey includes 11 true and false questions regarding stroke, and whether they had a discussion with their child about stroke, and if they uploaded the FAST phone application onto their mobile phone. The teacher survey included five questions using a Likert type survey with room for comments at the end (Appendix I).

Data Analysis

Research Question 1: Will stroke knowledge (including pathophysiology, symptoms, and treatments) in fifth graders increase?

Data from the pre-test and post-test will be expressed as the mean (of correct responses) +/- the standard deviation. This study will not be powered to detect statistical differences between pre- and post-test scores, and thus, comparative statistics (e.g., t-tests) will not be used.

Research Question 2: Will fifth grader intent to call '911' increase?

One specific question on the pre- and post-test will address this particular aim of the study and will be expressed as the mean (of correct responses) +/- the standard deviation.

Research Question 3: Will fifth grader conversation about stroke occur with their families using mobile phone technology?

Data from parental post-test will be expressed as means +/- standard deviation.

Research Question 4: Will parents take part in an educational stroke survey?

Data from parental post-test will be expressed as means +/- standard deviation.

Research Question 5: Will the fifth grade teacher have a positive perception of the stroke educational intervention?

There will be both quantitative data from the Likert scale and qualitative data from the fifth grade classroom teacher.

Ethical Considerations

The following are three key ethical principles that apply to all research involving human subjects and include beneficence, respect for person, and justice. Beneficence indicates researchers must minimize harm and maximize benefits; meaning human research should produce benefits for participants and/or similar situations (Polit & Beck, 2012). Beneficence incorporates the following participant rights: *Right to Freedom from Harm and Discomfort* and the *Right to Protection from Exploitation* (Polit & Beck, 2012). Beneficence was an important component in my research as the intervention was used with intention to improve health outcomes and reduce knowledge gaps. The participants also benefited from the stroke education program as it increased their health knowledge and thus, are better prepared to respond in the event of an acute stroke. Further, the educational intervention promoted stroke awareness discussions with family members, particularly parents and or caregivers, which further extended stroke education into the community.

Additionally, no physical harm came from participating in this study; however, minimizing the potential for psychological distress in those affected by stroke was considered (Polit & Beck, 2012). One way the potential for psychological distress was minimized, was by

honoring the third ethical principle, *Respect for Person*, and allowing any student to opt out of the educational program if they desired. Participation was voluntary and the students were given the opportunity for assent prior to the intervention.

Respect for person includes the *Right to Self-Determination* and indicated participants could voluntarily decide whether to take part in the study (Polit & Beck, 2012). The respect for person's ethical principle was further maintained by allowing participants to ask questions regarding the study, to refuse information, and to withdraw from the study at any moment (Polit & Beck, 2012). A week prior to the educational program at the school, the teacher read her script (Appendix J) and gave all students an informational packet containing a flyer with details of the educational program (Appendix K), and a combined parental permission form for participation (Appendix L). The packet was sent home with the students to give to their parents. The flyer asked for the consent forms to be returned within the week. The teacher reminded the students during the week to bring back the consent forms, if their parents decided to allow their student and themselves to participate. The teacher collected the consent forms for the PI. If a parent did not wish for their student to participate in the research study, the student was not given a pre- and post-test but was given the option to remain in the classroom and listen to the education and participate in the games if they wish. If those not participating in the study did not want to be part of the education, they were provided an area of the classroom where they could do an alternative activity of the teacher's choosing. Only students with signed parental consent forms were allowed to assent for the research study. Verbal assent from the students with parental consents were obtained the day of the intervention in the classroom prior to the start of the lesson and were documented with a sign in sheet. Any student could opt out of the educational program

if they did not wish to participate. If the student did not wish to participate in the research study, then they were not given a pre- nor a post-test but remained in the classroom for the duration of the intervention and could take part in the presentation and games if they choose. If the student did not wish to participate in the presentation/games, they were provided an area of the classroom where they can do an activity of the teacher's choosing. A separate consent form will be provided for the teacher who will be asked to complete a survey (Appendix M).

Lastly, the third principle *Justice*, relates to fair treatment and the right to privacy. The principle of justice was maintained in the study by treating all participants with equality and fairness, even those who decided to opt out of the study (Polit & Beck, 2012). Additionally, all data collected was kept confidential and private. Participants and parents had the opportunity to ask questions regarding privacy and confidentiality. And all participants as well as parents had access to my contact information to ask any questions that may arise.

OTHER INFORMATION

Projected Budget

The projected budget for this DNP project was minimal. Costs included printing surveys, homework packets, parental packets and the costs of prizes for children. The prizes for the children include a stress ball in the shape of a heart ($1.25 per item), a pencil ($0.20 per item), and an eraser in the shape of a brain ($0.20 per item).

RESULTS

Description of the Study Population

The fifth-grade class had a total of 24 students and one teacher. Among 24 eligible study subjects, 22 students were present on the day of the intervention, 10 females (45%) and 12 males (50%). The age range of the students was 10-11 years old. Seven out of the 22 participants identified as Hispanic (32%), four participants identified as Arabic (18%), three identified as African American (14%), three identified as Native Americans (14%), four identified as Caucasian (18%), and one identified as Asian (5%). Of note, 7 out of 22 eligible participants were enrolled in English Language Learners (ELL), indicating English is their second language. All (100%) of the 22 eligible subjects gave assent by signing in and gave permission to be a part of the study. Therefore, all 22 students completed both the pre-test and the post-test. However, only 19 out of 22 (87%) of students returned their parental consents; thus, the final number of eligible participants equaled 19 total students (8 females and 11 males). Only the data from those 19 participants, who had both parental consent and gave student assent, was analyzed. Only eight parental surveys were returned five days after the intervention. One of the eight parental surveys did not have a parental consent, so only seven were used for data analysis. Demographic information on parental consents was not available. Lastly, the teacher was a female in her mid-30s and she provided consent as well as completed her survey.

Description of the Stroke Educational Event

Students received informational flyers about the study on a Monday along with parental consents and had until Friday to return them. On her own account, the teacher offered an incentive (a treat) for students to return parental consents. The educational intervention took

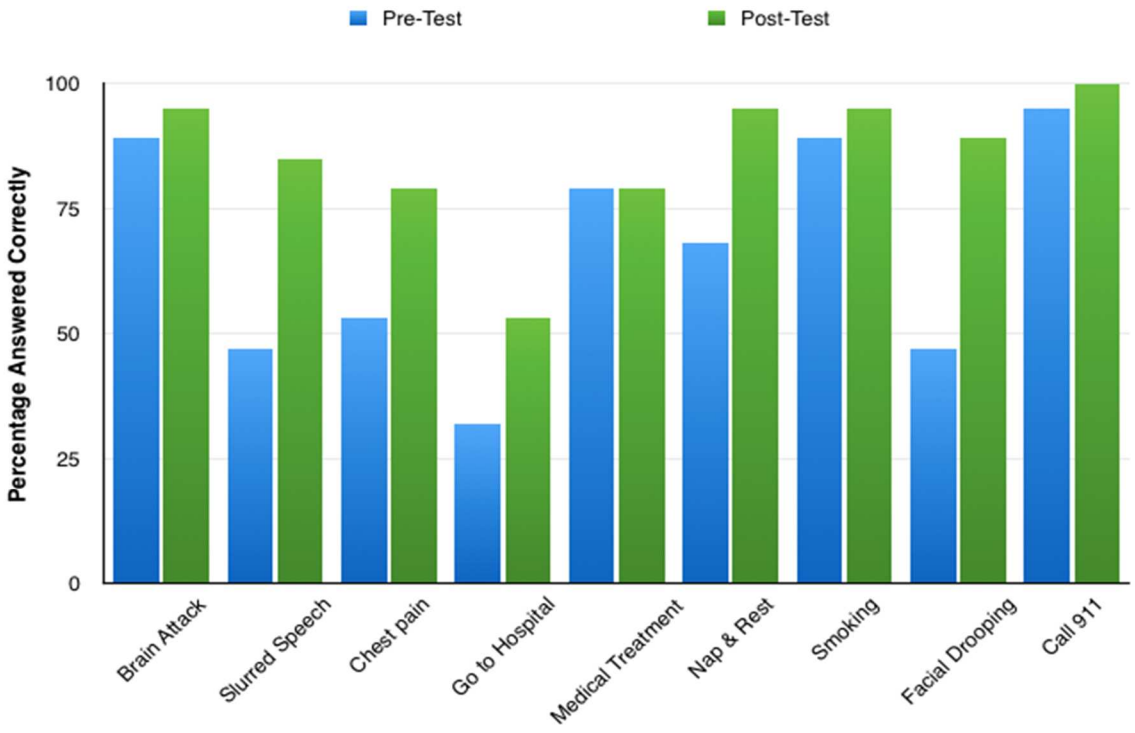
place on Friday morning at 8:00 AM, per the discretion of the classroom teacher. The students reported to class at 07:30 AM and completed their daily morning routine prior to the intervention. The classroom was arranged in six groups of four desks. The teacher introduced the PI and had the PowerPoint presentation displayed on the classroom Smart Board. The remaining parental consents were collected and the educational lesson began promptly at 8:00 AM and lasted a total of 45 minutes, as projected. The intervention began with student assent and a sign-in sheet. Per recommendations from the teacher, the pre-test was administered with the use of privacy folders so no copying or cheating could take place. To ensure the students could read the pre-test questions, the teacher read the questions aloud. Students wrote their first and last name on the pre-test so information could be matched up with parental consents. The PowerPoint presentation was then presented followed by a review of the FAST phone application.

Because cell phones were not allowed in the classroom, the technology had to be altered to IPad's but the same procedures were used. Three of the PI's personal IPads were utilized and were placed on airplane mode during the intervention with only the FAST app displayed. The students worked in three groups and took turns using the app on the IPads and reading the information. Per the instruction of the teacher, each group created a movement to represent each letter of the pneumonic FAST to help them remember the information. At the end of the phone app review, one student per group presented their "movements" to the pneumonic to the entire class.

The intervention was concluded with a question and answer session, review of the homework packet and parental survey, the stroke game, and finally the post-test. The same procedures were used to administer the post-test with the use of privacy boards and the teacher

reading the questions aloud. Students were given a stress ball for participation in the game and at the end, all the students received a stress ball. All students were instructed to talk to their parents/adults at home about what they learned, share the phone application with them, and give them a survey to participate. Students were instructed to bring back parental surveys on Monday for a small prize (pencil and brain eraser) which was given to the teacher to hand out. Results of student pre-test and post-test are shown in Table 1.

TABLE 1. *Frequency of Correct Stroke Knowledge Responses*



Aim 1

Results indicated that for each item on the pre- and post-tests, except one (*Medical Treatment*), the score on the post-test was better than the score on the pre-test. Prior to the intervention, many students did not know common signs of stroke based on the pre-test results.

Only 47% of students knew slurred speech was a common sign of stroke and 53% did not think facial drooping was a common symptom. Some 53% thought chest pain was also an early sign of stroke. Several students (89%) identified smoking as a risk factor and many (68%) indicated if someone was having a stroke they should *not* nap and rest.

Notably, the scores improved for questions that asked about stroke symptoms, risk factors, and what to do when witnessing a stroke on post-test analysis. In almost all questions, the percentages of correct answers increased post intervention (Minimum percent increase: 6% - Maximum percent increase: 38%). The percentage of correct answers for stroke symptoms improved at the post-test as well (slurred speech from 53% to 79%, chest pain is not a symptom from 53% to 79%, and facial drooping increased from 47% to 89%).

Only one question asking about medical treatment had the same score in the pre-test as well as the post-test where 79% answered correctly, and 21% answered incorrectly. Interestingly however, more than half of the students knew the correct answer to the question indicating they knew there is medical treatment for stroke.

Aim 2

Based on pre-test scores, 95% of students knew to call 911 if they thought someone was having a stroke, even if they could not identify the most common signs and symptoms. Post-test scores indicated all students (100%) would call 911 if they thought someone was having a stroke.

Aim 3

More than half of students (74%) specified they knew how to navigate a smart phone. Based on a show of hands during the intervention, more than half of the classroom showed they currently own and use a smart phone. Lastly, scores on post-test evaluations found 95% of

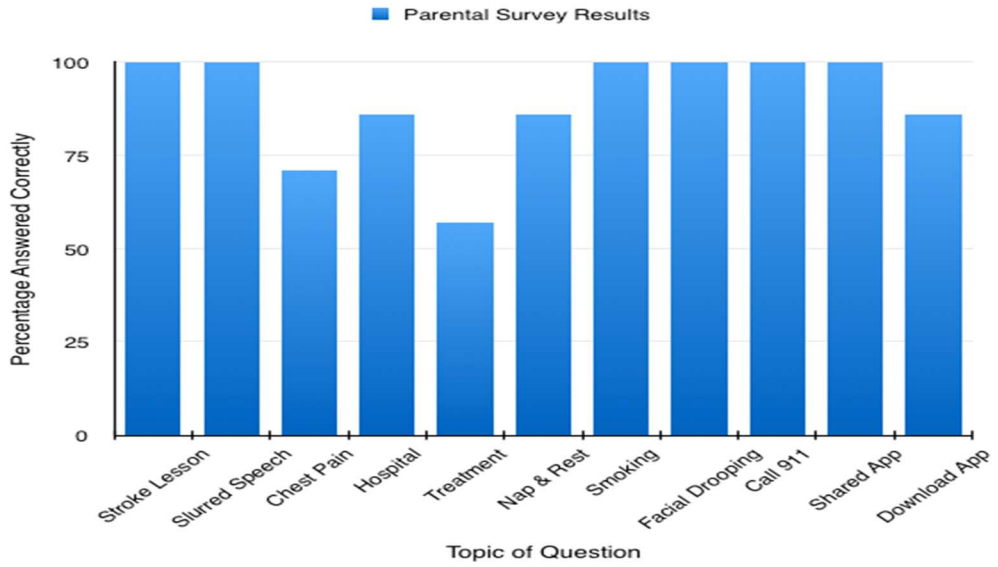
students agreed with the statement signifying they would use the FAST app to talk to others about stroke signs and symptoms.

Aim 4

Parental Survey

Out of the seven parental surveys, all (100%) indicated their student talked to them about the stroke lesson. All students (100%) also shared the stroke FAST mobile phone application with their parent or adult at home. In regards to the questions asking about stroke signs and symptoms, 100% identified slurred speech correctly and 100% identified facial drooping correctly as a common sign. Most (71%) answered correctly and did not choose chest pain as a common sign of stroke. These results show most parents/adults at home can correctly identify common early signs of stroke. The most commonly missed question was #5) *There is no medical treatment for stroke*, where only 57% answered correctly. Notably, almost all 6 out 7 (86%) indicated they downloaded the FAST stroke application to their mobile device. The results are included in the table below.

TABLE 2. *Frequency of Correct Stroke Knowledge Parental Responses*



Aim 5

Teacher Survey

The teacher survey included five questions with Likert-type answers and room for comments at the end. The Likert-type survey answers included strongly agree, agree, neutral, disagree, and strongly disagree, for the answer choices. The teacher survey was filled out post-intervention by the fifth grade classroom teacher. Based on the survey results, she strongly believed the stroke lesson was appropriate for fifth graders. She strongly believed her students

benefited from the educational program and thought the education should be included in the curriculum. She also indicated she would be willing to incorporate such a stroke program into her current curriculum as well as supported the use of technology as a learning tool. She included the following comments: “I thought the content was age appropriate and applicable to real life. Several have family members whom had suffered a stroke and I’m sure many more will in the future. They must know what to do.”

Observations

Anecdotal observations were made in the classroom on the day of the educational intervention. The teacher recommended the intervention be completed first thing in the morning because the students are most “attentive” and less “restless” in the morning. All the students were well-behaved, interacted, followed instructions, were enthusiastic, and appeared to be genuinely interested in the information presented. Based on the type of questions asked, the students wanted to know more about the pathophysiology of stroke. They asked questions like, “What causes stroke?” or “What exactly is a clot made of?” The students were especially thrilled about using and playing with the FAST application on the iPads. They expressed interest in the FAST pneumonic and stated the stroke app was easy to use. They had no problems navigating thru the application. Creating movements to each letter of the mnemonic helped the students retain the FAST information and the students really seemed to enjoy the exercise as well. Although, without the movement exercise, the intervention could have easily been done in 25-30 minutes. Lastly, the use of incentives, such as handing out stress balls for participation in the stroke game really encouraged participation, as more students raised their hands to answer questions.

DISCUSSION

The purpose of the study was to increase stroke knowledge among fifth graders with the intent to improve stroke outcomes and to address a gap in school-based stroke education using a mobile device supported program. The study was undertaken due to the significant morbidity and mortality surrounding stroke and the lack of knowledge surrounding recognizing stroke symptoms. Moreover, stroke outcomes are significantly improved with early recognition and early treatment. The study was purposely done in a multi-ethnic school with intention to target the highest-risk population for stroke.

Stroke Knowledge

With respect to the first objective, stroke knowledge, results show the innovative stroke education program using a novel technology improved fifth grade knowledge on stroke symptoms, pathophysiology, and treatment. Even though most students knew to call 911 if they thought someone was having stroke, most could not correctly identify common signs and symptoms prior to intervention. Various studies, including this one, have demonstrated children have the ability to learn and comprehend stroke knowledge and awareness. This study highlights the ability for young people to learn about stroke especially those in high-risk communities to expand the number of individuals capable of recognizing and responding to acute stroke symptoms. Furthermore, as the anecdotal findings reveal, fifth grade students are enthusiastic learners which speaks to the promise of our ability to teach the young about health related topics.

Intent to Call 911

For the second objective of the study, intent to call 911, most students knew prior to the intervention the importance of calling 911 if someone was having an acute event, even if they

could not necessarily recognize the early warning signs. Post-intervention data indicated all students (100%) would call 911 if they suspect someone is having a stroke. Other studies have yielded similar results; illustrating the students' understanding of the importance of getting help fast, as they may be key to activating emergency services early on.

Student-Parent Communication

Student conversations with families about stroke using mobile phone technology was shown to occur based on the data analyzed from the parental surveys. Although a small number of parental surveys were returned (37%), it is noted students do have conversations with their parents about stroke and utilized the FAST mobile phone application to do so. Further, the results show some parents are willing to participate in parental surveys. Although there is a need to improve response rates from parents, these impressive findings show parental learning is possible when students learn. More importantly, knowledgeable students can potentially serve as a channel using the mobile app as a tool, to spread stroke awareness to high-risk adults within the community.

Teacher Perception

Lastly, the teacher survey suggests a positive perception of the stroke educational intervention meeting the final objective. The teacher indicated she strongly agreed her students greatly benefited from the lesson as well as supported the use of technology in her classroom. She commented on the importance of the topic and stated it was very "applicable to real life [as]…several have family members who have suffered a stroke and I'm sure many more will in the future." Additionally, the teacher supported the use of mobile technology, such as iPads, as a learning tool and the students displayed incredible interest and enthusiasm while using the iPads and navigating thru the stroke application.

Sustainability of Stroke Education

Based on the results of the study, the classroom teacher indicated she could easily implement the stroke program into the student curriculum. As the literature suggests, single-session interventions may be as effective as longer interventions and simpler interventions are less burdensome to the curriculum, and therefore, are considered more sustainable (Beal, Flanders, & Bader, 2016). Given the simplicity of the stroke lesson and age appropriateness, the intervention has great potential to be easily implemented into fifth grade curriculum and has a high probability of being sustainable.

Use of Mobile Technology

Based on my research, no studies to date have implemented sustainable school-based interventions using mobile technology (iPad or smart phone) in conjunction with a reliable mobile phone stroke application. As the data points out, 20% of third graders have their own cell phones and approximately 90% of them can access and play games online. Approximately 39%

of fifth graders have their own cell phones, which is similar to the number of hands raised in the classroom when asked who owned a smart phone (about half). These types of statistics show young children, even as young as third graders, are comfortable with using mobile phone technology. In today's society, where children are acculturated in the use of mobile devices, this type of technology serves as an excellent platform for education. This study shows the practicality of implementing a time efficient, mobile device-based supported stroke education for school aged children. Likewise, anecdotal observations discovered students have great interest in the mobile stroke phone application as well as utilizing technology in the classroom for learning. Reportedly, 95% of students indicated they would download and share the stroke app with others. Remarkably, 86% of parents stated they downloaded the FAST stroke app onto their phones; further increasing the number of stroke app users, and thus, increasing stroke awareness among parents/families as well.

Stroke Education in Diverse Populations

The research study was also conducted in a multiethnic classroom with primarily Hispanic participants. Few research studies have been done with fifth grade students in this particular high-risk ethnic group, even though stroke awareness is low among Hispanic Americans and even lower in Spanish-only speaking Hispanic Americans (Williams et al., 2014; DuBard, Garrett, & Gizlice, 2006). This study highlights the value of a sustainable school-based stroke education program as it has great potential to mitigate the knowledge deficit among Hispanic Americans that are considered high-risk for cerebrovascular disease. Given that the Hispanics American population is projected to keep outpacing other ethnic groups in the state of Arizona, the need for stroke awareness will inherently increase.

Given the novel approach of using mobile technology stroke application, and a simple, yet noteworthy stroke lesson, this research has contributed to the existing literature and has also created future opportunities for research.

Recommendations for Future Research

Results from this study demonstrate research projects such as this one can be done effectively and that children want to learn about stroke and/or health related topics. Using the results and methodology from this research study, the next step would be to expand the program to other fifth grade classrooms and assess long-term retention of information. Future studies can also evaluate the benefits of using mobile technology compared to traditional forms of learning. Also, incorporating more sophisticated statistical analysis of data could yield better results. Based on the types of questions received from the students, including more information on the pathophysiology of stroke and the brain would also be appropriate to set up a better foundation. Incorporating classroom activities that increase knowledge retention, such as the movements created with the mnemonic FAST, should also be implemented in future programs.

This study also shows that communication from school to home occurs, but can be difficult to assess, so novel ways to engage and increase parental responsiveness may be warranted. In future studies, one may consider to include both Spanish and English parental surveys as language may be a potential barrier; especially in multi-ethnic classrooms like this one, where several students were enrolled in ELL indicating English was their second language. Further, teacher involvement and reminders for students to bring back parental consent forms were key and should be implemented in future studies. In other similar studies targeting Hispanic students, they found low parental participation as well. Conley et al., (2010) suggested strategies

including greater efforts to distribute and collect parental surveys such incorporating a planned banquet for students and their parents as well as offering monetary incentives. Beal, Flanders, and Bader (2016) suggests to explore linking parents or grandparents' health status with stroke risk, which may personalize the topic and increase interest and possibly parental participation as well.

Lastly, future studies looking to implement mobile technology supported stroke educational programs, may want to consider gathering more data regarding participant and parental mobile technology usage as well.

Limitations

Although the study data yielded positive outcomes and impressive results, several limitations of the research study are noted. The first limitation of the study is a small sample size of 19 students. However, the sample included over six ethnicities, many of which are considered high-risk for stroke, with the majority of the participants identifying as targeted population, Hispanic Americans. Due to the short duration of the study and timing of post-test immediately after intervention, long-term retention of knowledge could not be assessed. Another study limitation is the lack of a control group. Finally, less than half of the parental surveys were returned (37%) yielding a small parental sample size as well.

Relevance to DNP Essentials

My research study aligns well with the DNP Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice. The Essential III regards scholarship and research as the foundation of the doctoral education as translation and application of research is an imperative skill for future practice. The completion of this doctoral research project underpins

several competencies within DNP Essential III. The project achieves several competencies as demonstrated by researching the literature surrounding stroke, critically appraising the evidence, translating the research to inform the study, and participating in collaborative research. Moreover, generating new evidence and enhancing the current state of the subject as well as highlighting potential areas of future research further demonstrates the competencies within Essential III.

The study also aligns well with Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health. The purpose of this stroke education study directly aligns with the provisions of health promotion and population health that comprises Essential VII. Given the topic and intervention of the research study, which increases stroke awareness and empowers participants through knowledge, the completion and application of this study highlight the key factors comprising this essential. Lastly, the study also promotes Essential VII as its overarching goal is to improve health outcomes, and thus, improve the health status of Arizona's high-risk populations.

Conclusion

Given the morbidity and mortality surrounding stroke in the United States and the lack of knowledge on the early signs of stroke, increasing awareness and knowledge are inherently needed to mitigate the detrimental effects of stroke and improve health outcomes on this highly prevalent condition. In the state of Arizona, the population of Hispanics is growing and is expected to continue outpacing the other groups in the upcoming years. Stroke literacy is lowest among Hispanic Americans and they are also considered a high-risk population; therefore, targeting this particular population is needed. Using novel mobile technologies to educate

today's youth in conjunction with a stroke lesson, yielded positive results. As this study found increasing stroke knowledge among fifth graders using a novel mobile technology supported school-based intervention is possible and, in fact, found students shared the information and stroke application with their parents and families at home. Findings also support the need for continual research on educating today's youth, targeting high-risk Hispanic population, and fine-tuning this sustainable stroke knowledge program for middle schools across Arizona.

APPENDIX A:

IRB APPROVAL LETTER

Research
Office for Research & Discovery

Human Subjects
Protection Program

1618 E. Helen St.
P.O.Box 245137
Tucson, AZ 85724-5137
Tel: (520) 626-6721
http://rgw.arizona.edu/compliance/home

Date:	October 05, 2017
Principal Investigator:	Yeimi Ines Rivera
Protocol Number:	1709857806
Protocol Title:	Increasing Stroke Knowledge Among 5th Graders Using an Educational School-Based Intervention
Level of Review:	Expedited
Determination:	Approved
Expiration Date:	October 04, 2018

Documents Reviewed Concurrently:

Data Collection Tools: DNP_Child Assent Sign In.docx
Data Collection Tools: DNP-5th Grade Stroke Curriculum Outline.docx
Data Collection Tools: DNPProjectParentalSurveyFinal.docx
Data Collection Tools: DNPProjectPost-Test1.docx
Data Collection Tools: DNPProjectPre-Test.docx
Data Collection Tools: DNPProjectTeacherSurvey.docx
HSPP Forms/Correspondence: DNP-IRB Form f200-revised.doc
HSPP Forms/Correspondence: DNPProjectF107 (1).doc
HSPP Forms/Correspondence: DNP-ProposalAppendixA-updated.doc
HSPP Forms/Correspondence: Signature page.pdf
Informed Consent/PHI Forms: DNP-Informed Assent Verbal Script v2017-09-26.docx
Informed Consent/PHI Forms: DNP-Informed Assent Verbal Script v2017-09-26.pdf
Informed Consent/PHI Forms: DNP-Parentstudent consent combined-updated v2017-09-26.docx
Informed Consent/PHI Forms: DNP-Parentstudent consent combined-updated v2017-09-26.pdf
Informed Consent/PHI Forms: DNPProject Teacher Consent-updated v2017-09-26.docx
Informed Consent/PHI Forms: DNPProject Teacher Consent-updated v2017-09-26.pdf
Other Approvals and Authorizations: Approvals.pdf
Other Approvals and Authorizations: DNP-ProjectPrincipalApproval .pdf
Participant Material: DNP 5th Grade Presentation.pptx
Participant Material: DNP Project Student Homework Packet.docx
Recruitment Material: DNP Project-Flyer UPDATE.pptx
Recruitment Material: DNPprojectTeacherScript-updated.docx

This submission meets the criteria for approval under 45 CFR 46.110, 45 CFR 46.111 and/or 21 CFR 50 and 21 CFR 56. This project has been reviewed and approved by an IRB Chair or designee.

• No changes to a project may be made prior to IRB approval except to eliminate apparent immediate hazard to subjects.

• The University of Arizona maintains a Federalwide Assurance with the Office for Human Research Protections (FWA #00004218).

• All research procedures should be conducted according to the approved protocol and the policies and guidance of the IRB.
• The current consent with the IRB approval stamp must be used to consent subjects.
• The Principal Investigator should notify the IRB immediately of any proposed changes that affect the protocol and report any unanticipated problems involving risks to participants or others. Please refer to Guidance Investigators Responsibility after IRB Approval and Reporting Local Information.
• For projects that wish to continue after the expiration date listed above please submit an F212: Renewal Progress Report, forty-five (45) days before the expiration date to ensure timely review of the project.
• All documents referenced in this submission have been reviewed and approved. Documents are filed with the HSPP Office. If subjects will be consented the approved consent(s) are attached to the approval notification from the HSPP Office.

APPENDIX B:

INFORMED CHILD ASSENT VERBAL SCRIPT

Informed Child Assent Verbal Script

My name is Yeimi Rivera. I am interested teaching young people about the condition called stroke because many people with stroke, usually adults, can have serious problems like having arms and legs be very weak or paralyzed or being unable to talk or think well. If I can teach young people about stroke maybe you can help recognize a stroke and get help FAST.

If you would like, you can be in my study. If you say yes, you will be a part of a lesson and games in the classroom to learn about what happens to the brain during stroke, how to recognize if someone might be having a stroke and what to do about it. You will also put an APP on your or a friend's cell phone, called the FAST APP that reminds you about stroke. You will also talk to your parents or an adult at home about stroke and show them the FAST APP for their cell phone.

If you decide you want to be in my study, you will fill out a survey before and after the class. You will also have your parents or adult at home, fill out a survey and then bring that back to class.

There are no known risks associated with participating, just your time (about 45 minutes) during your regular class. Your grade will not be affected with or without participation in the study.

Other people will not know if you are in my study. All information will be kept confidential. I am not asking for your name on any of the materials, so I will not know what information came from you. When I tell other people about my research, I will not use your name and instead will report all the information together, so no one can tell who I am talking about.

By filling out the surveys before and at the end of class, you agree to be in my study. If you don't want to be in the study, no one will know, no one will be mad at you, and you will still be able to participate in the lesson and games to learn about stroke. If you do want to be in the study now, and change your mind later, that's OK. You can stop at any time.

I will be happy to answer any questions you may have now, during, or after the class. If you would like to participate please participate in the stroke lesson and games in your classroom on October 20th, 2017 please sign in to give permission and complete the surveys. By signing in, attending, and completing the surveys, you agree to be included in the research. Thank You.

APPENDIX C:

CHILD ASSENT SIGN-IN SHEET

Child Assent Sign-in Sheet

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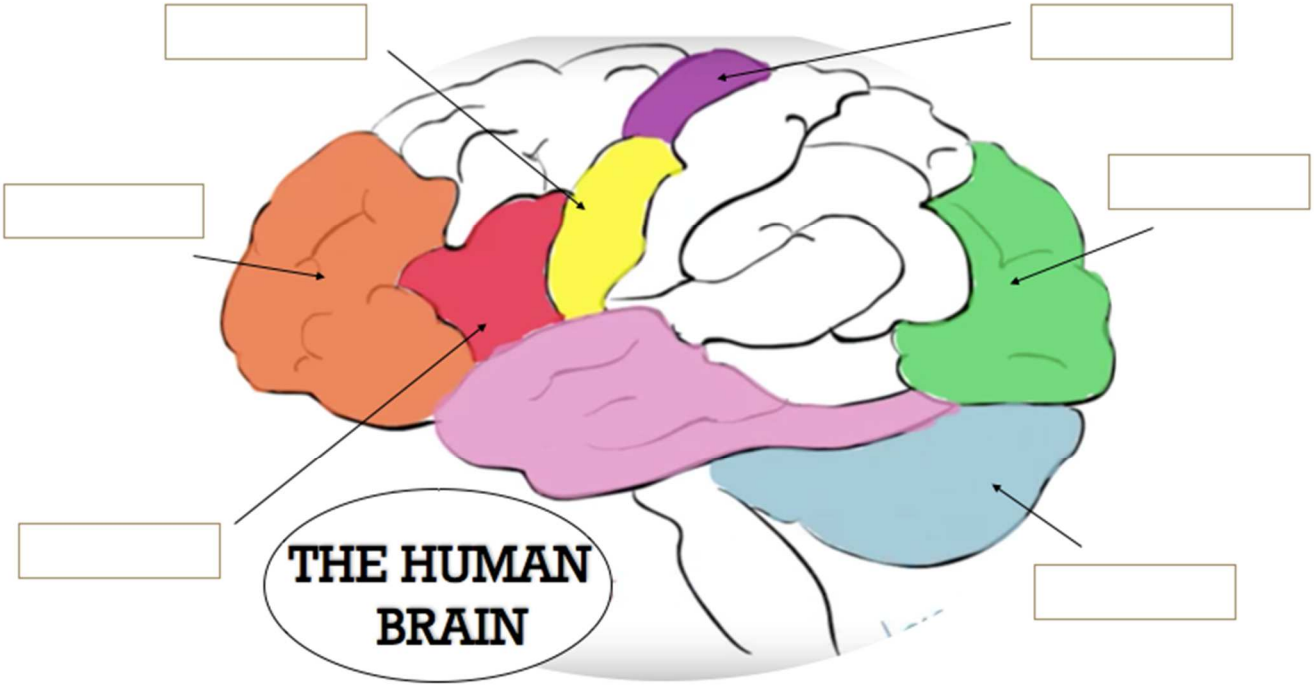
APPENDIX D:

FIFTH GRADE STROKE EDUCATION STUDENT HOMEWORK PACKET

5th Grade Stroke Education
Student Homework Packet

Name:_____

Date:_____



1. Fill in the blanks using the symptoms below that go with the part of the brain affected. Each symptom will be used once.

- Confusion
- Changes to vision
- Loss of balance
- Face Drooping
- Arm weakness
- Speech Problems

Stroke Prevention

How to Download
American Heart Association
"Spot a Stroke Fast" Phone App

1. Android Device

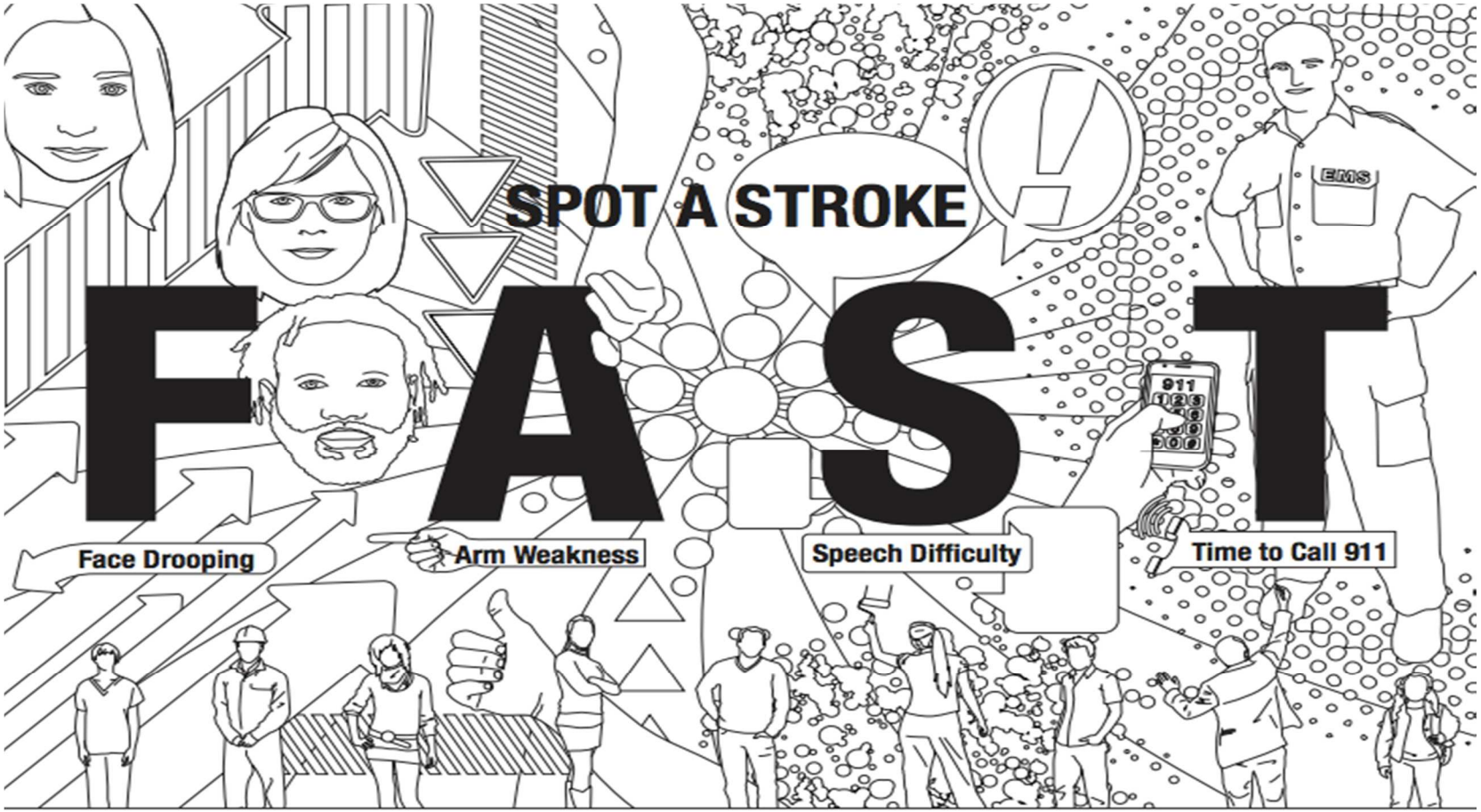
1. Open Google Play Store.
2. Search for the magnifying glass icon at the upper right of your screen.
3. Type in the name of the application Spot a Stroke FAST and tap search.
4. Tap the icon.
5. Tap the "Install" button.
6. Press "Accept."

2. iPhone Device

1. Open the App Store.
2. Tap Search.
3. Type in an app's name: Spot a Stroke FAST and tap Search.
4. Tap GET.
5. Tap INSTALL.
6. Enter your Apple ID password if asked.

Answers to the Human Brain (p.1): Yellow- Face Drooping, Purple- Arm Weakness, Red-Speech Problems, Orange-Confusion, Blue- Loss of balance, Green-changes to vision.

Act F.A.S.T Fun Coloring Page



APPENDIX E:

PARENT LETTER TO GO HOME WITH STUDENTS

[Date]

Dear Parents,

There are over 750,000 new strokes in America every year. Every 40 seconds, on average, someone in the U.S. falls victim to a stroke and every 4 minutes a stroke victim dies. Currently, only one in five people know the warning signs of stroke and what to do.

Today your child had the opportunity to participate in a research study to learn about stroke signs and symptoms, the importance of dialing 911 at the first sign of stroke and learn about a stroke phone application.

80% of strokes can be prevented by knowing the risk factors and making changes. Early lifestyle modifications can reduce the risk of stroke. We encouraged your child to eat healthy, exercise and refrain from drugs and smoking to help reduce their risk of stroke as they get older. A packet of materials was given to your child that includes information regarding what they learned today.

Recognizing the symptoms of stroke, rapidly calling 911 and reducing risk factors is important information for everyone to know.

We would love to have you talk with your child today about what they learned, the activities they participated in, review the phone application with them, and complete the parental survey on the following page. Please, have your child return the survey tomorrow for a prize.

4 out of 5 families are touched by stroke- protect your family by passing the information on.

Thank you for helping us spread the word.

For more information about strokes you can visit: **strokeassociation.org**

Thank You,

Yeimi Ines Rivera RN BSN S-DNP
University of Arizona College of Nursing

APPENDIX F:

PARENTAL SURVEY

Parental Survey

Please complete the following True or False survey.

1. My child talked to me about the stroke lesson s/he learned in school.	_____	_____
2. Slurred speech is a common symptom of a stroke.	_____	_____
3. Severe chest pain is a common symptom of a stroke.	_____	_____
4. If stroke symptoms go away, you do not need to go to the hospital.	_____	_____
5. There is no medical treatment for a stroke.	_____	_____
6. If you think someone is having a stroke, have them take a nap and rest.	_____	_____
7. Smoking increases the chances of having a stroke.	_____	_____
8. Facial drooping is a common symptom of a stroke.	_____	_____
9. If you think someone is having a stroke, you will call 911.	_____	_____
10. My 5th grader shared the Stroke F.A.S.T mobile phone application with me.	_____	_____
11. I have downloaded the Stroke F.A.S.T mobile phone application.	_____	_____

(This quiz is adapted from the National Stroke Association's LEAP Program by Retreat & Refresh Stroke Camp)

APPENDIX G:

FIFTH GRADE EDUCATION STROKE AWARENESS PRE-TEST

Fifth Grade Education Stroke Awareness
Pre-Test

	TRUE	FALSE
1. A stroke is a brain attack.	_____	_____
2. Slurred speech is a common symptom of a stroke.	_____	_____
3. Severe chest pain is a common symptom of a stroke.	_____	_____
4. If stroke symptoms go away, you do not need to go to the hospital.	_____	_____
5. There is no medical treatment for a stroke.	_____	_____
6. If you think someone is having a stroke, have them take a nap and rest.	_____	_____
7. Smoking increases the chances of having a stroke.	_____	_____
8. Facial drooping is a common symptom of a stroke.	_____	_____
9. If you think someone is having a stroke, you will call 911.	_____	_____
10. I know how to use a smart phone.	_____	_____

(This quiz is adapted from the National Stroke Association's LEAP Program by Retreat & Refresh Stroke Camp)

APPENDIX H:

FIFTH GRADE EDUCATION STROKE AWARENESS POST-TEST

Fifth Grade Education Stroke Awareness
Post-Test

	TRUE	FALSE
1. If stroke symptoms go away, you do not need to go to the hospital.	_____	_____
2. I will use the FAST app to talk to others about stroke signs and symptoms	_____	_____
3. Severe chest pain is a common symptom of a stroke.	_____	_____
4. A stroke is a brain attack.	_____	_____
5. Smoking increases the chances of having a stroke.	_____	_____
6. If you think someone is having a stroke, have them take a nap and rest.	____	_____
7. If you think someone is having a stroke, you will call 911.	_____	_____
8. Facial drooping is a common symptom of a stroke.	_____	_____
9. There is no medical treatment for a stroke.	_____	_____
10. Slurred speech is a common symptom of a stroke.	_____	_____

(This quiz is adapted from the National Stroke Association's LEAP Program by Retreat & Refresh Stroke Camp)

APPENDIX I:

FIFTH GRADE EDUCATION STROKE AWARENESS TEACHER SURVEY

Fifth Grade Education Stroke Awareness
Teacher Survey

	Strongly Agree	*Agree*	*Neutral*	*Disagree*	*Strongly Disagree*
1. I believe the stroke education lesson is appropriate for 5th graders.	_____	_____	_____	_____	_____
2. I believe my students benefited from the stroke educational program.	_____	_____	_____	_____	_____
3. I believe stroke education should be included in my student's curriculum.	_____	_____	_____	_____	_____
4. I could see myself implementing the stroke program into my curriculum.	_____	_____	_____	_____	_____
5. I support the use of mobile phone technology as a learning tool.	_____	_____	_____	_____	_____

Additional comments:

APPENDIX J:

TEACHER SCRIPT

Teacher Script

This Friday you will have the opportunity to learn about brain attacks or strokes and participate in a research study. The fun stroke lesson will teach you about stroke signs and symptoms and what to do when witnessing a stroke. A guest speaker, a graduate student from the University of Arizona will be teaching the course in our classroom on Friday. Here is an information flyer and permission form to take home to your parents/legal guardians. Have your parents/legal guardians review the information and sign the consent form if they are okay with you being a part of the research study. Please bring back signed forms by Friday. Friday morning, you will have the opportunity to decide if you want to be a part of the research study and the fun stroke education.

An Institutional Review Board responsible for human subject's research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

APPENDIX K:

PARENTAL FLYER

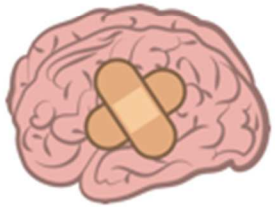
DO YOU KNOW THE SIGNS AND SYMPTOMS OF A STROKE ?

Next week your child will have the opportunity to participate in a research study to learn about **stroke signs and symptoms** and what to do when witnessing a stroke.

Date: October 20th, 2017
Time: 8am
Location: Ms. Moscioni's 5th grade class at Cactus Wren Elementary
Duration: 45 minutes

PARENTS/LEGAL GUARDIANS: YOUR PERMISSION IS NEEDED. PLEASE REVIEW CONSENT FORMS ON THE NEXT PAGE AND HAVE YOUR STUDENT RETURN IT TO MS. MOSCIONI WITHIN THE WEEK.

*If you do not want your student to participate in the research study, your student will not be given a pre and post-test, but will be given the option to remain in the classroom and listen to the education and participate in the games if they wish. If those not participating in the study do not want to be part of the education, they will be provided an area of the classroom where they can do an alternative activity of the teacher's choosing. The University of Arizona IRB has reviewed and approved this research project.



There are over 750,000 new strokes in America every year. Every 40 seconds, on average, someone in the U.S. falls victim to a stroke and every 4 minutes a stroke victim dies. Currently, only *one in five people* know the warning signs of stroke and what to do.

APPENDIX L:

THE UNIVERSITY OF ARIZONA PARENTAL PERMISSION FOR CHILD'S PARTICIPATION IN RESEARCH

The University of Arizona Parental Permission for Child's Participation in Research

Study Title: Increasing Stroke Knowledge Among 5th Graders Using an Educational School-Based Intervention

Principal Investigator: Yeimi I. Rivera, RN, DNP Candidate, College of Nursing, University of Arizona

This is a parental permission form for research participation. It contains important information about this study and what to expect if you participate and permit your child to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and ask questions before making your decision whether or not to participate and permit your child to participate.

Participation is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you and your child may discontinue participation at any time without penalty or loss of benefits.

Why is this study being done?
This study is being done because stroke is a serious condition in our country and can leave a person with serious disabilities. Due to the significance surrounding the public health burden of stroke and to address a gap in school-based stroke education, the purpose of this project is to evaluate using a time efficient, mobile device supported stroke education program for 5th graders
and their parents who live in a multi-ethnic community.

How many people will take part in this study?
All students in one 5th grade classroom, a parent or adult at home, and classroom teacher will be included in this study. A normal size class room is about 25-30 students, so up to about 60 people will be included in this study.

What will happen if my child takes part in this study?
During the normal classroom time, your child will be asked to fill out a survey before and after a lesson about stroke. They will also be shown how to download a stroke phone application on their or a friend's phone that is meant as a resource for signs and symptoms of stroke If a child does not have a phone, they may either share with a friend, or review it one of the four researcher's personal iPads that will be brought into the classroom. Additionally, if phones are not allowed in the classroom, all the students will have written instructions at a 5th grade reading level on how to download the phone application onto their phones outside of the classroom. The students will then be given a "homework" packet that includes a picture of the brain, a coloring page, a letter to the parents, as well as the parental survey to take home. They will also be asked to share what they learn about stroke and the phone stroke app with a parent or adult at home and then return a parent/adult survey to school.

What will happen if I take part in this study?
After your student completes a stroke lesson at school, they will be asked to discuss what they learned and share a stroke phone application with you. They will be asked to share a parent/legal guardian survey for you to complete. The survey takes five minutes to complete. Your student will be asked to bring your completed survey back to school.

How long will my child be in the study?
The study will be conducted during your child's routine classroom day and will last approximately 45 minutes.

How long will I be in the study?
The survey takes 5 minutes to complete.

Can my child stop being in the study?
Your child's participation is voluntary. You or your child may refuse to participate in this study. If your child takes

part in the study, you or your child may decide to leave the study at any time. No matter what decision you make, there will be no penalty to you or your child and neither of you will lose any of your usual benefits. Your decision will not affect your future relationship with the school or The University of Arizona. If your child does not want to be in the study they can still participate in the stroke lesson.

Can I stop being in the study?
Your participation is voluntary. You may refuse participation in this study. If you take part in the study, you may decide to leave the study at any time. No matter what decision you make, there will be no penalty and you will not lose any of your usual benefits. Your decision will not affect your future relationship with the school or The University of Arizona.

What risks, side effects or discomforts can my child expect from being in the study?
There are no known risks associated with the study.

What risks, side effects or discomforts can I expect from being in the study?
There are no known risks associated with the study.

What benefits can my child expect from being in the study?
Possible benefits include increased knowledge about signs of stroke and prevention of stroke.

What benefits can I expect from being in the study?
Possible increased stroke knowledge and what to do when witnessing an acute stroke.

Will my child's study-related information be kept private?
By law, your child's pre and post-test records may be reviewed by the following groups: Office for Human Research Protections or other federal, state, or international regulatory agencies and The University of Arizona Institutional Review Board. No personal information will be used in any publication or presentation.

Will my study-related information be kept private?
By law, your survey records may be reviewed by the following groups: Office for Human Research Protections or other federal, state, or international regulatory agencies and The University of Arizona Institutional Review Board. No personal information will be used in any publication or presentation.

What are the costs of taking part in this study?
Time is the only costs for taking part in the study.

Will I or my child be paid for taking part in this study?
You will not be paid to be in this study. Your child will receive small study related toys (a pencil, eraser, and a small squeezable stress ball) when the parental surveys are returned.

What are my child's rights if s/he takes part in this study?
If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study. You and your child will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study. You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled.

What are my rights if I take part in this study?
If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study. You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study. You may refuse to participate in this study

without penalty or loss of benefits to which you are otherwise entitled.

An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Who can answer my questions about the study?
For questions, concerns, or complaints about the study you may contact the Principle Investigator, Yeimi I. Rivera, at (602-515-2003).

For questions about your child's rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or http://rgw.arizona.edu/compliance/human-subjects-protection-program.

Signing the parental permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study. I am not giving up any legal rights by signing this form.

_____
Printed name of subject (student)

_____
Printed name of person authorized to provide permission for subject (parent or adult)

_____
Signature of person authorized to provide permission for subject (parent or adult)

Signing the permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study. I am not giving up any legal rights by signing this form.

_____
Printed name of subject (parent/legal guardian)

_____
Signature of subject (parent/legal guardian)

APPENDIX M:

THE UNIVERSITY OF ARIZONA RESEARCH PARTICIPATION TEACHER CONSENT FORM

The University of Arizona Research Participation Teacher Consent Form

Study Title: Increasing Stroke Knowledge Among 5th Graders Using an Education School-Based Intervention

Principal Investigator: Yeimi I. Rivera, RN, DNP Candidate, College of Nursing, University of Arizona

This is a permission form for research participation. It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and ask questions before making your decision whether or not to permit your child to participate. Participation is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits.

Why is this study being done?
This study is being done because stroke is a serious condition in our country and can leave a person with serious disabilities. This study will educate 5th graders about causes and signs of stroke and what to do when witnessing a stroke. 5th graders will also share what they learn with their parents or adult at home. This study is being done because stroke is a serious condition in our country and can leave a person with serious disabilities. Due to the significance surrounding the public health burden of stroke and to address a gap in school-based stroke education, the purpose of this project is to evaluate using a time efficient, mobile device supported stroke education program for 5th graders and their parents.

How many people will take part in this study?
All students in one 5th grade classroom, a parent or adult at home, and classroom teacher will be included in this study. A normal size class room is about 25-30 students, so up to about 60 people will be included in this study.

What will happen if I take part in this study?
You will be asked to complete a brief survey regarding the stroke education intervention which took place in your classroom.

How long will I be in the study?
The survey takes 5 minutes to complete.

Can I stop being in the study?
Your participation is voluntary. You may refuse participation in this study. If you take part in the study, you may decide to leave the study at any time. No matter what decision you make, there will be no penalty and you will not lose any of your usual benefits. Your decision will not affect your future relationship with the school or The University of Arizona.

What risks, side effects or discomforts I can expect from being in the study?
There are no known risks associated with the study.

What benefits can be expected from being in the study?
An opportunity to provide feedback on the stroke educational intervention held in your classroom.

Will my study-related information be kept private?
By law, your survey records may be reviewed by the following groups: Office for Human Research Protections or other federal, state, or international regulatory agencies and The University of Arizona Institutional Review Board.

What are the costs of taking part in this study?
Time is the only cost.

Will I or my child be paid for taking part in this study?

You will not be paid to be in this study.

What are my rights if I take part in this study?
If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study. You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study. You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Who can answer my questions about the study?
For questions, concerns, or complaints about the study you may contact the Principle Investigator, Yeimi I. Rivera, at (602-515-2003).

For questions about your participation in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or http://rgw.arizona.edu/compliance/human-subjects-protection-program.

Signing the permission form
I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study. I am not giving up any legal rights by signing this form.

_____
Printed name of subject

_____
Signature of subject

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