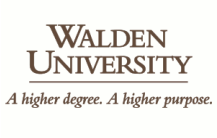

2017

Implementation and Evaluation of Code Stroke in Emergency Department for Maternity Patients

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This is to certify that the doctoral study by

Linda Catherine Castillo

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2017

Abstract

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by

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Diploma in Nursing Trinidad and Tobago, 1977

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

January 2017

Abstract

Strokes are a significant source of morbidity and mortality in pregnant women, influenced by the physiologic changes in pregnancy and the trend of older and sicker women becoming pregnant. Despite the role of stroke in pregnant women, emergency departments in specialized maternity hospitals may not be as experienced in stroke recognition and care as are typical emergency departments. The purpose of this project was to create a protocol to facilitate rapid assessment and treatment of pregnant and postpartum women with symptoms of stroke in a maternity emergency department. The IOWA model of evidence-based practice to promote quality care guided a systematic review of literature in a quality improvement process. An interdisciplinary team developed the code stroke protocol through discussions that incorporated National Stroke Association guidelines into the policies and procedures of a southwestern maternity hospital. Deliverables to the hospital included a decision-making algorithm with treatment inclusion/exclusion criteria. An informational poster was developed to facilitate implementation of the protocol at a later time. Patient charts will be reviewed, comparing actual patient management to timeline benchmarks, in order to evaluate the code stroke protocol. The code stroke protocol can decrease morbidity and mortality by reducing stroke as a pregnancy complication, consistent with Healthy People 2020 goals and contributing to positive social change.

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Dedication

Many years ago a young nurse with the dreams of higher education embarked on a journey to the United States of America to obtain something that was unreachable in her home country. To the United States of America, I thank you for the opportunity of reaching this milestone. To my 87-year-old mother who is my biggest cheerleader. To my deceased father who always believed in me and taught me to reach for the moon. To my loving husband who sacrificed his sleep and stayed up with me reading the Bible many nights while I reviewed research articles and wrote papers. I could not have done it without you.

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I acknowledge Stella Motanya, DNP, FNPC, who has been my source of inspiration and a shoulder to cry on. Many days I was ready to give up and you encouraged me to persevere and keep going. Without your encouragement I would have never reached this far. I also acknowledge Andrea Harrow, DNP. You have been my guiding light throughout this journey. You have been more than a mentor. You have taken me under your wings during your busy schedule to help me accomplish my dream. I will make you proud. To all the nurses who traded with me to allow me the time to work on my projects, I thank you and acknowledge you.

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Section 1: Overview of the Evidence-Based Project

Introduction

Strokes do not only happen to patients at stroke centers, and every hospital emergency department should expect and be prepared to care for patients experiencing a stroke. A maternity hospital is not exempt from managing a stroke, especially because there has been a significant increase in the rate of strokes among pregnant and postpartum women in the past few years (Jones, Baird, Thurman, & Gaskin, 2012). All hospitals should be able to recognize stroke as a *brain attack*, a medical emergency that needs immediate intervention to improve patient outcomes (NIH, 2006). Hospitals should develop an alert notification for essential personnel to respond immediately in the event of a stroke to prevent further brain dysfunction and or death (Hoegerl, Goldstein, & Sartorius, 2010). An example of an alert is a code stroke alert.

Patients experiencing signs and symptoms of a stroke should receive optimal care even if they are not at a stroke center. Emergency Medical Service (EMS) are trained to transport patients with symptoms of a stroke to the nearest designated stroke center (Phend, 2013). However, many patients arrive by private vehicles to specialty hospitals such as women or cancer treatment, uncertified stroke hospitals, or in rural hospitals. Therefore, all emergency departments should provide care that is "safe, effective, patient centered, timely, efficient, and equitable ... [and] delivered at the point of service" (Ridenour & Trautman 2009, p. 359) using the best evidence available for rapid assessment, initiation of treatment, stabilization, and transfer to a higher level of care such as a designated stroke center if indicated.

Stroke is a medical emergency. According to the National Stroke Association (n.d. p. 1), "two million brain cells die every minute during a stroke, increasing the risk for permanent brain damage, disability and/or death." Therefore, recognizing the symptoms of a stroke and acting expeditiously can save lives and limit disabilities. Thus, medical professionals need to transform they health care system by advancing policies and protocols such as code stroke in maternity specialty or rural hospitals to promote better patient outcomes (Ridenour & Trautman, 2009). In this chapter, I identify the problem statement, project objectives, and goals.

Problem Statement

Childbirth is usually a very happy and exciting time. No one expects a pregnant or postpartum mother to die or become disabled from a stroke. The normal expectation of pregnancy and childbirth is that the mother and child or children will be discharged home. Yet complications such as a stroke can occur for these women, robbing them of the excitement and happiness of childbirth. Stroke increases the risk of maternal mortality and morbidity during pregnancy and the postpartum period (Jeng, Tang, & Yip, 2004). However, medical professionals frequently overlook and misdiagnose symptoms of strokes in this population in as much as 50% of the cases as flu, migraine, urinary tract infection, and so forth (Stone, 2007). Advances in stroke care changed the national stroke rating from being the third leading cause of death to the fourth leading cause of death (Jauch et al., 2013). Nonetheless, strokes in pregnant and postpartum women have increased significantly over the past few years (Hellwig, 2011).

Many risk factors for a stroke are beyond the control of the pregnant or postpartum woman. Due to advances in science, technology, and fertility treatment, older women and women with multiple comorbidities are becoming pregnant. In the pathophysiology of stroke, it starts with decreased or no blood circulation to the brain due to a clot or hemorrhage. Stroke is also referred to as "brain attack" because it "occurs when the blood supply to the brain is blocked or when a blood vessel bursts [and] part of the brain becomes damaged or dies" (Centers for Disease Control and Prevention [CDC], 2013, para 2). (Shah, n.d.) explains that within 1 hour of decreased oxygenation or hypoxia, referred to as the *golden hour*, brain cells are at risk for injury. However, with the appropriate intervention this can be partially or completely reversed within 3 hours.

The body has ways of protecting itself. Sahar and Russell (2014) explained that there are physiologic changes during pregnancy to prevent the woman from bleeding to death while giving birth. These changes put a woman at risk due to hypercoagulability, which can cause arterial or venous thrombo-embolism. Thus, this preparation of the body has a downside of increased clotting, which can lead to a stroke (Treadwell, Thanvi, & Robinson, 2007). There are many risk factors for stroke during pregnancy, and some are modifiable while others are not. "Maternal age greater than thirty-five, ethnicity black, high blood pressure, smoking, diabetes, migraine headache, alcohol and drug abuse, multiple gestation, clotting disorders, and infections" (Treadwell et al., 2007, p. 238) are some of the risk factors.

Hypertension is a risk for stroke in the general population. Skidmore, Williams, Franklin, Alonso, and Biller (2001) showed that the most common comorbidity during

the pregnancy and postpartum period is hypertensive disorders. Therefore, the risk for stroke is increased by comorbidities and women becoming pregnant at an older age. This population requires heightened vigilance in recognizing subtle signs and symptoms of a stroke. However, the practicum site involved in this project did not have a clear, organized, and consistent plan for recognizing, evaluating, treating, or transferring patients with stroke to a primary or comprehensive stroke center.

Purpose Statement

The purpose of this Doctor of Nursing Practice (DNP) project was to have a protocol to facilitate rapid assessment and treatment of pregnant and postpartum women with symptoms of stroke. The effects of a stroke in a pregnant and postpartum woman are devastating and translate into high cost to the health care system (Nadereh, et al., 2013). Therefore, it was important that health care workers reduce the morbidity or mortality related to strokes in pregnancy and the postpartum period by acting quickly to reduce the risk of permanent brain damage, disability, or death. No woman should die or become disabled because of inconsistent or deviations in stroke care. Thus, a protocol was important in order to provide consistent care for the management of pregnant and postpartum women with stroke symptoms.

Goals and Objectives

The goal of this program was to produce an organized systematic approach to stroke care in the maternity emergency department to expeditiously screen, evaluate, and treat and/or transfer patients experiencing symptoms of a strokes to a primary or comprehensive stroke center. The protocol is in the form of an algorithm, making it easy

to follow so that emergency department staff can use it to appropriately screen and triage patients with symptoms of a stroke by following and adhering to the protocol. The code stroke protocol contains a consistent, organized process to ensure that maternity patients experiencing a stroke will receive high quality evidence-based care.

Currently the maternity hospital involved in this project does not have a protocol for screening and evaluating patients experiencing signs and symptoms of strokes. This puts the patients and staff in a vulnerable position because of the lack of consistency and lack of a systematic process, thereby delaying care. The protocol will prompt staff to quickly determine if a stroke is in progress and then process, apply the protocol, and activate the team for rapid evaluation and treatment. Therefore, the objective for this project was to develop a code stroke protocol that will be implemented and outcomes evaluated after completion of the project.

Definition of Terms

The following definitions are used for this project.

Acute stroke ready hospitals are those facilities that would otherwise not be candidates for primary or comprehensive stroke care but are equipped to treat stroke patients with timely evidence-based care prior to transferring them to primary or comprehensive centers (Alberts et al., 2013)

Code stroke is defined as an organized plan to facilitate rapid assessment and treatment of an acute stroke based on the best available evidence (Gomez et al., 1994).

Designated stroke centers are centers that meet the standards and are certified by The Joint Commission for making exceptional efforts to foster better outcomes for stroke

care. Stroke centers can be primary or comprehensive centers that are fully equipped for acute stroke treatment including clot buster drug (tissue plasminogen activator [t-PA]) and providing extensive evaluation and management of the stroke patient (Gorelick, 2013).

Hemorrhagic stroke occurs due to a weakened blood vessel in the brain that ruptures. The most common cause of hemorrhagic stroke is hypertension but it can also be caused from aneurysm and arteriovenous malformation (strokeassociation.org).

Ischemic stroke occurs when there is an obstruction within a blood vessel that supply blood to the brain. Ischemic stroke accounts for 87% of all strokes (CDC, n.d.).

Stroke is defined as a medical emergency where prompt treatment is crucial to prevent brain damage and/or death. It occurs when brain tissue is deprived of oxygen and food due to interruption or severely reduced blood supply to the brain cells (Mayo Clinic, n.d.). Stroke is divided into three major categories: Ischemic stroke, hemorrhagic stroke, and transient ischemic attack.

Transient ischemic attack, also called mini stroke, is a warning sign that needs to be taken seriously. These are caused by a temporary clot in the brain (strokeassociation.org).

Limitations

Health care is rapidly changing. Health care workers have to be able to change to meet these demands to provide care that is safe, patient-centered, efficient, effective, timely, and equitable (Institute of Medicine, 2001). Regardless of the hospital a pregnant or postpartum stroke patient goes to, she should receive the same standard of care.

However, this is easier said than done. Efforts to institute policy and protocols based on evidence-based guidelines have been challenging because some stakeholders for this project have had reservations about protocols. Being able to identify knowledge gaps and variations in the practice of stroke care for pregnant and postpartum women made the need for change very transparent that no woman should have mortality or increase morbidity because of the emergency room (ER) that she chose to go to when having a stroke. It is health care providers' duty to do no harm, thus providing the best care possible in any given situation or location.

Significance / Relevance to Nursing Practice

Due to advancement in science and technology in health care and in fertility treatment, women with multiple comorbidities and older women are becoming pregnant (Vulliemoz & Kurrnczak, 2012). According to Mozaffarin et al (n.d.). In the general population, hypertension has been known to be a risk for stroke. Skidmore et al. (2001) showed that the most common comorbidity during pregnancy and postpartum is hypertensive disorders. Pregnancy increasing the risk for stroke complicated by comorbidities and women becoming pregnant at an older age requires heightened vigilance to recognize subtle signs and symptoms of stroke in maternity patients. Recognizing symptoms and acting fast can save lives and limit disabilities. Triage nurses cannot miss the warning signs because the consequences of missing them can be tragic.

Evidence-Based Significance

Evidence-based stroke care is very well established and nationally recognized for "the remarkable decline in stroke mortality [and] acknowledged as one of the 10 great

public health achievements in the United States in the 20th century" (Lackland et al., 2013, p. 316). However, strokes that happen outside of stroke centers may not receive the same high quality of care, that is, at an obstetrics and gynecology (OB/GYN) ER because, according to Cheng, Chen, Chen, and Chen (2010), an obstetrician may be the first physician these women encounter. Therefore, it is important that every obstetrician and maternity ER staff have an awareness of strokes and recognize that it can happen to any of these women. Also, Jauch et al. (2013) reported comparing patient outcomes in primary stroke centers versus community hospitals without specialized stroke care demonstrated that the patients who received specialized stroke care to have better clinical outcomes. Thus, expanding stroke care to nonstroke hospitals (i.e., a maternity hospital ER) will help decrease the door-to-needle time. It will allow these patients to receive the same standard of care by rapid evaluation and transfer to a stroke center because "prompt intervention may diminish morbidity / mortality and promote functional outcomes" (Cheng et al., 2010, p. 399), while expediting transfer to a designated stroke center.

The guidelines will be explicit for the ER management of acute stroke from the time of arrival to the ER to the time of transfer. The guidelines will be in a step-by-step process that is timed according to the National Institute of Health (NIH) National Symposium Recommendation (i.e., Door-to-MD: 10 minutes, Door-to-Neurological Expertise: 15 minutes, Door-to-CT Scan: 25 minutes, Door-to-drug: 1 hour, etc.; Jauch, n.d.). The guidelines will be evidence-based, which, according to Fineout-Overholt, Levin, and Melnyk. (2005), is a "problem-solving approach that incorporates the best available scientific evidence, clinician expertise, and patient preferences and values" (p.

28). Therefore, when a pregnant or postpartum woman presents to a nonstroke center, OB/GYN ER with signs and symptoms of a stroke, she will receive the same standard of care by utilizing an evidence-based stroke protocol to ensure safety and better outcome.

Potential for Social Change

A vital role of the DNP-prepared graduate is to influence change. Change is not always easy but "knowledge is power" and having the knowledge to use the best evidence available to produce and utilize protocols for stroke will be effective and efficient in reducing inconsistencies of the trial-and-error method currently being used. Evidence-based practice "offers a means to stop bumping on the back our heads: to terminate the cycle of habitual practice, to substitute evidence for opinion "(White & Dudley-Brown, 2012, p. 105). And, set the stage for using best practices for better patient outcomes.

The pregnant and postpartum patient population is changing due to increased maternal age and increased comorbidities; therefore, not having the knowledge and the protocols will lead to inconsistencies and suboptimal care. Lack of knowledge of strokes in this population is not uncommon because of the myth that strokes only happen to older people. No one expects a 33-year-old pregnant woman who is having her first child and complaining of a headache will soon die of a massive cerebral bleed. Hence, the reason recognition and prompt intervention are so important and that all ERs, big or small, general or specialty, should be stroke ready. Jauch et al. (2013, para 26) described a "stroke ready" hospital as "hospitals that have made the institutional commitment to

effectively evaluate, diagnose, and treat most emergency rooms stroke patients but do not have an organize inpatient stroke system of care."

Summary

This chapter highlighted a real and significant problem faced by emergency departments that are not stroke ready when presented with patients having an acute stroke. It also emphasized the importance of developing a well thought out plan to recognize and rapidly assess patients having a stroke in order to avoid or lessen the devastating effects of strokes on pregnant and postpartum women. Code stroke protocols have proven to be successful in using the best evidence available when dealing with someone having an acute stroke. This project will contribute to the knowledge base by establishing a code stroke protocol to be used to lessen staff confusion when dealing with a stroke patient and for better outcomes of these women as well.

Section 2: Review of Scholarly Evidence

Introduction

The purpose of this project was to develop a plan for implementation and evaluation of code stroke protocol in a maternity emergency department. ER nurses at this maternity hospital will become astute in recognizing signs and symptoms of stroke in pregnant and postpartum women and expeditiously triage and begin evidence-based care. This chapter describes the review of literature for the purpose of identifying, analyzing, integrating, and summarizing studies conducted on strokes in pregnant and postpartum women. The primary aim is to identify evidence-base practice for pregnant and postpartum women with strokes.

Literature Search Strategy

When conducting a literature search for the identified clinical problem (Does maternity specific triage system in the emergency department provide guidelines to facilitate early recognition of pregnant and postpartum women suffering with strokes?), the strategies used to support the clinical problem were literature reviews and existing guidelines relevant to this clinical problem of interest. The search for literature was conducted electronically by using the following databases: CINAHL, PUBMED, Medline, EBSCO, Cochrane Databases, and the CDC. Search criteria consisted of the following key words: *stroke, Code Stroke, perinatal stroke, pregnancy, postpartum*. To produce a larger volume of articles, Boolean "and" and "or" were used between other words. The search was limited to English language articles from January 2000 to 2014. Criteria considered when researching this problem included studies addressing a plan for

problem intervention of educating staff on strokes and a plan for developing a code stroke protocol. The review revealed copious published research related to strokes in pregnant and postpartum women. Using literature reviews provided clear and concise data for developing code stroke protocol for maternity patients.

Strength of the articles was obtained by using Level I to VII as presented by Melnyk and Fineout-Overholt (2011). The tool suggested that high strength level of evidence articles were I to III, moderate strength was Level IV to V, and low strength were VI to VII. Preference was given to Level I to III because of its scientific basis and not just based on experience and opinions.

Criteria for selection of articles were determined according to relevance to maternity patients with strokes. Only the articles with strong evidence focusing on the strokes particularly in pregnant and postpartum women were considered and the others were excluded. The search revealed 119 articles, but 21 met the criteria for inclusion.

Literature Review

Terry (2011) described a literature review as "an account of what has been published on a topic by researchers, critically appraising each data source for its relevance rather than simply summarizing what the author originally stated" (p. 48) Pregnant and postpartum women exhibiting signs and symptoms of a stroke may be inadequately diagnosed or under-treated because of their age and the myth about young adults and strokes. Research has shown that between 1994 to 1995 and 2006 to 2007 stroke rose 83% in pregnant and postpartum women (Hellwig, 2011). Pregnancy and postpartum have been shown to put women at increased risk for stroke, rupture of

aneurysm, and rupture of arteriovenous malformation, which is an important cause of morbidity and mortality in these women and account for 12% of all maternal deaths (Jeng et al., 2004). Merely taking into account someone's age because she is pregnant or recently gave birth should not rule out the fact that she might be having a stroke.

The National Stroke Association (n.d.) reported that in the general population there is an estimated 7,000,000 stroke survivors over the age of 20 and that a stroke occurs every 40 seconds and takes a life every 4 minutes. Pregnant and postpartum women are at increased risk for strokes and cerebral hemorrhage due to the pathophysiological changes that occur in their bodies in preparation for birth (Tate & Bushnell, 2011). Therefore, it should be an expectation to be mindful that it can occur because when it does it has "serious consequences including long-term disability and death, in young women with newborns or unborn babies" (Cheng et al., 2010, p. 395). Many studies have been done on strokes in pregnant and postpartum women, but most of them in foreign countries. However, Tate and Bushnell (2011) reported that a study in 46 hospitals in Baltimore and Washington, DC showed that during the postpartum period the risk of ischemic stroke and intracerebral hemorrhage increased. Other studies done in Canada, Taiwan, Asia, and the United Kingdom had similar results (Tate & Bushnell, 2011, p. 2).

Regardless, whether the risk is beyond anyone's control, the most important thing during this phase is recognition for early intervention and better outcome. Munz (2013) discussed a case in which a 20-year-old who was 28 weeks pregnant and admitted to the hospital for a small placental tear and then began complaining of a headache later died of

a stroke. Snow and Amos (2010) also discussed a case in California in which a husband witnessed his wife dying of a stroke 30 hours after having a C-section. Nakashima et al. (2003) reported that a 27-year-old woman at 34 weeks' gestation experienced a severe headache and the computed tomography (CT) revealed subarachnoid hemorrhage and intra cranial hematoma. Another 29-year-old at 31 weeks' gestation reported disturbance of consciousness and the CT scan revealed cerebral infarction. Therefore, it is not uncommon for these women in the prime of their lives to suffer such an insult to their bodies.

The death rate in California after giving birth tripled in the last decade from 5.6 deaths per 100,000 to 16.9 per 100,000 in 2003 (Snow & Amos, 2010). Maternal deaths are deaths that occur within 42 days of delivery and many maternal deaths are considered unavoidable (Berg, Callagan, Syvrson, & Henderson, 2010). The incidence of strokes in pregnant and postpartum Taiwanese women is 46.2 and 21.47 respectively per 100,000 (Cheng et al., 2010). Thus Cheng et al. (2010) suggested that women with pre-eclampsia and eclampsia should be followed for at least the first year after delivery to reduce the occurrence of stroke. Tate and Bushnell (2011) also discovered that strokes in pregnant and postpartum women were three times more prevalent than in nonpregnant women of comparable age. However, because pregnant and postpartum women are usually young adults, prompt diagnosis and treatment present a special challenge (Tate & Bushnell, 2011) because of their ages, attributing to increased morbidity and mortality in this population. Even though these women are young adults, health care providers in this

setting have to realize the complexity of pregnancy and that these women are not exempt from having a stroke.

However, if a maternity patient is having a stroke, like any other patient with stroke-like symptoms, there are guidelines and treatment for stroke. However, these treatments are time sensitive and "these patients should be triaged with the same priority as patients with acute myocardial infarction or serious trauma, regardless of the severity of neurological deficit" (Jauch et al., 2013, p. 878). Therefore, now more than ever it is very important that organization have acute stroke care readiness (Markus, 2007). The stroke campaign manual outlines specific best practices strategies for reducing door-to-needle time for intravenous (IV) t-PA for acute ischemic stroke: advanced notification by EMS if applicable, rapid triage protocols and stroke notification, single call activation system, stroke tools, rapid acquisition and interpretation of brain imaging, rapid laboratory testing, and rapid access to t-PA (Gregg, et al., 2011).

IV t-PA has to be given within 3 hours of the onset of symptoms. Therefore, rapid assessment and evaluation of symptoms—nursing assessment, medical doctor evaluation, stat CT with interpretation, labs preferably at the point of care—are critical to meeting the goal for thrombolysis if indicated. Thrombolysis for acute ischemic stroke has not been clinically tested in pregnant women therefore, in the past it has been regarded as relatively contraindicated (Wiese, Tikad, Mathews, & Wang, 2006). However, Wiese et al. (2006) went on to say that there are three reported cases in the literature of pregnant women who were treated with thrombolytic agents; two with IV t-PA in the first trimester and the third with intra-arterial t-PA at 37 weeks' gestation. Though those in their first

trimester had complication with bleeding, they all had improvement in their symptoms and delivered healthy infants. Thus, it is crucial that these women be seen and evaluated quickly and transferred to a stroke center where a neurologist will determine the course of action.

Stroke Signs and Symptoms

The National Stroke Association (n.d.) states that few people in the United States know the warning signs of stroke. Therefore, it makes sense why people may not believe or understand that a pregnant woman is having a stroke. According the American Heart Association/American Stroke Association (n.d.), there are five sudden symptoms in stroke: weakness, speech difficulty, vision loss, severe headache, dizziness. Pregnant or postpartum women may only complain of a headache. However, ER nurses should be extra cautious when assessing a pregnant or postpartum woman with headache. Triage nurses regardless of the institution should recognize a stroke in progress by initiating the face arms speech time (FAST) test. Quickly ask the person to smile to check to see if one side of the face droops. Ask the person to raise both arms to check for drift. Ask the person a question to check for slurring of speech. Finally, ask when the symptoms started (National Stroke Association, n.d.). Acting FAST can reduce the amount of brain cell dying, reduce disability, and decrease death.

Prevalence and Incidence

Pregnancy and postpartum deaths are tragic for the family, friends, and the society as a whole. Nevertheless, the CDC (2013) reported that hundreds of women die in the United States each year as a result of pregnancy or delivery complications. And, one to

two women die of pregnancy related complications daily. What is sad about this is most pregnancy-related deaths are preventable (CDC, n.d.). A stroke is the second leading cause of death in young women in the United States and Canada, and when it is associated with pregnancy the mortality and morbidity increases (Jeng, Tang, & Yip, 2014). More young women between the ages of 15 and 35 suffer from strokes than do young men. Stroke was the fifth cause of maternal deaths during 1980 to 1985 (Silver & Jaigobin, 2000). Stroke is also the leading cause of disability in young adults and the incidence of pregnancy-related strokes increased from 2,000 in 1995 to 3,000 in 2007 (Doheny, 2011) Tate and Bushnell (2011) reported 34.2 strokes per 100,000 deliveries, and strokes account for more than 12% of maternal deaths (Treadwell et al., 2007).

Impact of Stroke

In the United States stroke is responsible for the death of almost 130,000 people yearly (CDC, 2013), some of whom are young women in the prime of their lives when trying to start or raise a family. Also, stroke is the leading cause of disability with a cost to the nation of $36.5 billion annually, which includes cost of health care services, medications, and loss of productivity (CDC, 2013). A young woman surviving a stroke may result in long-term disability and suffering for everyone involved. Lanska and Kryscio (2000) conducted a retrospective study in the United States and gave an example of the outcome of maternity patients post stroke. And, stated, “Among the 183 patients with stroke, 133 were discharged routinely, 8 were discharged to another short-term hospital, 10 were discharged to skilled nursing, 2 were discharged to home health, 1 left against medical advice, and 29 died” (Lanska & Kryscio, 2000, p 1276). The normal

expectation of childbirth is that mother and newborn will be discharged home; however, as demonstrated by this study, some mothers who survive after a stroke are not discharged home, which can put added strain on this young family.

Application of Findings to Practice

Findings of the study give relevance to having all ERs stroke ready regardless of their patient population. The findings in the literature showed the significance of having an organized plan to facilitate rapid assessment and treatment of acute stroke. Age should not be a deterrent to rule out stroke in a pregnant or postpartum woman. Instead, pregnancy should be a warning flag. As nurses, it is inherent to "do good" and "tend to the personal needs of people related to health" (McCurry, Revell, & Roy, 2009, p. 45). Being able to rapidly evaluate and treat pregnant and postpartum women with signs and symptoms of strokes using the best evidence is very empowering. Therefore, the model that best suits this clinical problem is the Iowa model (Figure 1). White and Brown-Dudley (2012) states, "The Iowa model … was developed as a decision-making algorithm to guide nurses to using research findings to improve the quality of care. [It] uses concept of triggers … [which] set the inquiry into motion" (p. 14). The model is ideal for the practice problem because it has steps that facilitate problem identification and solution development as it relates to incorporating evidence findings into practice. The model consists of seven steps: selection of a topic, forming a team, evidence retrieval, grading the evidence, developing evidence-based practice standards, implementing evidence-based practice, and evaluation (Doody & Doody, 2011) and is useful when developing algorithm and protocols.

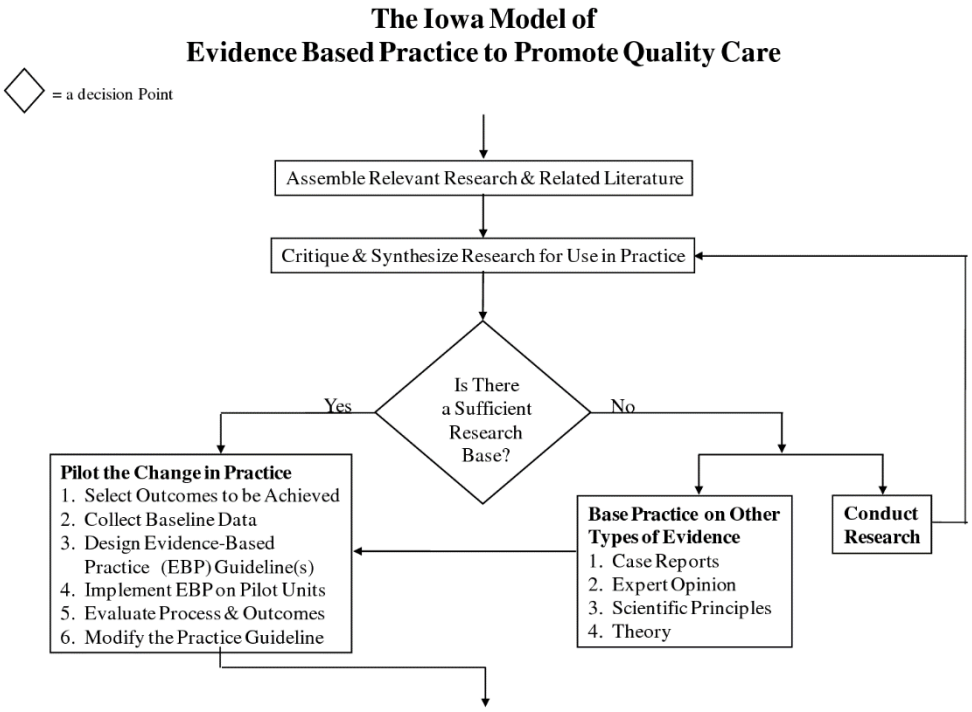

Figure 1. Iowa model is used for planning and developing a code stroke protocol for women in a maternity hospital ER.
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Summary

Review of the literature clearly defined that pregnant and postpartum young adults are at higher risk of strokes than nonpregnant women of similar ages. This knowledge can influence a practice change by educating ER nurses on recognizing signs and symptoms of stroke in this population and by developing evidence-based protocols for consistency in care and for better outcomes by using the best evidence available. In the next chapter, the plan for developing a code stroke for maternity ER will be addressed.

Section 3: Approach and Methodology

Introduction

Maternity patients are high risk for stroke and can suffer a stroke while at a maternity hospital or, when experiencing symptoms of stroke, may choose to go to a hospital ER where her OB/GYN practices. Therefore, the purpose of this project was to develop a plan for the implementation and evaluation for a code stroke protocol in an ER for maternity patients. Accomplishment of this plan was done by developing the following activities:

- Recruit an interdisciplinary project team of institutional stakeholders for stroke care
- Review the literature for best practices for stroke care in pregnant and postpartum women
- Develop protocol for code stroke in the emergency department
- Develop an implementation plan
- Develop an evaluation plan

Interdisciplinary Team

The members of the interdisciplinary team were chosen because of their knowledge, expertise, and interest in best practices in stroke care for pregnant and postpartum women. They all had different perspectives of code stroke. I reviewed the literature, according to Terry (2011) literature review is a review of scholarly articles that gives an accurate account of what has been published by researchers on a topic. I

reviewed literature on maternal morbidity and mortality related to strokes looking to answer the following question: Does a maternity specific triage system in the emergency department provide guidelines to facilitate early recognition of pregnant and postpartum women suffering with strokes? It is important to have stakeholders from a variety of disciplines because even though planners may already know the solution, input from stakeholders can put "a fresh analysis of the condition and problem [that] may lead to a number of different interventions or programs" (Kettner, Moroney, & Martin, 2013, p. 46) and a successful program. No pregnant or postpartum woman should die or become disabled because of the hospital emergency department she chose, and she should receive the same standard of care while initiating transfer to a stroke center. The members on the code stroke committee were

- Project chair and writer of this project
- Emergency department physician / Neurologist
- Emergency department charge nurses
- Radiologist
- CT technician
- Pharmacist
- Director of laboratory
- ER director of nursing
- Risk management
- Nursing supervisor
- Information Technology

Implementation Plan

The practicum site had no organized plan for evaluating and treating pregnant and postpartum women with stroke. Treatment was not consistent and outcomes varied. Therefore, it was evident that a practice change was needed for better outcomes of pregnant and postpartum women who are admitted to this maternity emergency department. This was accomplished by using the best evidence to develop a code stroke protocol for a maternity hospital emergency department. The proposed code stroke protocol plan for this capstone project was drafted and presented to the stroke committee for review, then to the hospital policy and procedure committee for approval and adoption and implementation upon completion of this project.

The mission of code stroke will align with the general mission of the institution, thereby delivering high quality cost-effective stroke care in an OB/GYN environment prior to transfer to a stoke center. Change is not always easy, but as stated by Kettner et al. (2013), "planning programs designed to achieve results is a very complex process … that requires some radical shifts in thinking" (p. 26). The purpose of the project was to have an organized plan to facilitate rapid assessment and treatment of pregnant and postpartum women with stroke by designing a code stroke protocol with a plan to implement and evaluate in this maternity emergency department. No woman should become disabled or die because of lack of appropriate evaluation and treatment and transfer of a pregnant woman with stroke. The goal of Healthy People 2020 (2010) is to reduce the rate of maternity deaths by 10%. Though strokes account for a fraction of maternal death, any maternal death is too many because most are preventable.

Stroke and cerebral hemorrhage are dangerous complications of pregnancy and postpartum (Sidorov, Feng, & Caplan, 2011) and symptoms must not be missed or delayed. Therefore, upon completion of this project a code stroke protocol will be available to be implemented in the ER. The ER and the triage process will include utilizing the code stroke protocol on all patients suspected of having neurological issues, such as severe headache, blurred vision, and so forth. The protocol will include an algorithm that the triage nurse will use to rapidly identify potential stroke patients by initiating the FAST test. This is accomplished by asking the patient to smile to check facial drooping (face); asking the patient to raise both arms with eyes closed to check to see if one arm drifts downwards and asking if the arm is weak or numb (arms); asking the person to repeat a simple sentence to see if they repeat it correctly or if speech slurred (speech); and asking the time the symptoms started (time). If any of these symptoms plus any other suspicion of stroke are apparent, triage the patient as emergent, check blood sugar, and initiate code stroke protocol.

Program Evaluation Plan

Hodges and Videto (2011) stated, "Program evaluation is an ongoing process that begins during program development" (p. 209). It is a systematic way to account for public health actions by involving procedures that are useful, feasible, ethical, and accurate. The evaluation strategy plan will be done by utilizing the guidelines for improved outcomes in door to treatment as recommended by National Institute of Neurological Disorders (NINDS) for stroke evaluation time benchmark for potential

thrombolytic candidate (Table 1). The process will provide a systematic approach to stroke care in a maternity ER, thus improving outcomes.

Table 1

Stroke Evaluation Door to Treatment Times

Time Interval	Time Target
Door to Doctor	10 minutes
Door to Neurologic expertise	15 minutes
Door to CT scan completion	25 minutes
Door to CT scan interpretation	45 minutes
Door to treatment	60 minutes
Door to stroke unit or ICU	2 hours

Note: Adapted from "Guidelines from Early Management of Patients with Acute Ischemic Stroke: A Guideline for Healthcare Professionals from the American Heart Association/American Stroke Association" by E.C. Jauch, J.L. Saver, H.P. Adams Jr, A. Bruno, J.J. Connors, B.M. Demaerschalk, P., . . . Council on Clinical Cardiology, 2013, *Stroke, 44*(3), p. 878. doi:10.1161/STR.0b013e318284056a

Summary

Nurses are the backbone of the hospital, advocate for the patient, and the eyes and ears of the physicians. Nurses are usually the first provider that patients see and the ones in contact with patients longer than any other health care professionals. Pregnant and postpartum women are at high risk for stroke and nurses should be knowledgeable about

the obvious signs as well as the subtle signs and symptoms of stroke and be able to intervene quickly to decrease the morbidity and mortality of strokes in this population.

Section 4: Discussion and Implications

Introduction

To recap, the purpose of this DNP project was to develop a plan for implementation and evaluation for code stroke in a maternity emergency department. One of the major issues facing health care providers at the practicum setting was that there were no specific guidelines for pregnant and postpartum women with stroke; therefore, there was no consistency and sometimes delays in evaluating and or treating these women. The objective of this project was to create the protocol that will be implemented by the practicum site after completion of the project. The goal is intended for rapid identification, evaluation, and treatment of pregnant and/or postpartum women with stroke, thereby creating positive social change by decreasing morbidity and mortality related to strokes in this population.

Discussion of Project Product

Treatment of strokes has taken great urgency since the approval of t-PA in 1996 (Miller & Elmore, 2005). However, this facility was seriously lagging behind. Therefore, the protocol was developed so that staff at this facility can have an organized plan for rapid assessment and treatment of diagnosis of acute stroke in pregnant and postpartum women. In accordance with the guidelines set forth from this project, the hospital now has a plan for initiating assessment, evaluation, and treatment of patients presenting to this maternity ER with symptoms of stroke. The majority of the patients present to this ER via private vehicle and the goal is to “beat the clock” because timing is critical for best outcomes in stroke patients. Thus, any patient presenting to this ER with a change in

neurological status will receive a rapid assessment including but not limited to assessment of airway, breathing, and circulation (ABC); face, arm, speech, and time of onset (FAST), stat accucheck, and vital signs. If the patient is within the 4.5-hour window from absolute onset of symptoms, a code stroke will be activated. The protocol was developed using best practices from a review of the literature, national guidelines, as well as input from facility stakeholders.

Discussion of Findings

After Walden University IRB department approved my project (Walden IRB approval no. 02-02-16-0051196), I took the lead and began working on the project with the stakeholders, who included the CEO, CNO, radiologist, neurologist, laboratory director, obstetrician champion, and quality director. Due to the stakeholders' busy schedules, I used various methods to correspond and communicate with the team. I had one-on-one communications, e-mails, telephone conference calls, and group meetings. During our meetings, we discussed the increase number of strokes in pregnant and postpartum women and what can be done to improve outcomes.

A combination of reviewing the literature, using evidence-based information to guide practice, obtaining input from stakeholders, and focusing on recommendations from national guidelines helped to develop this evidence-based practice protocol for code stroke in maternity patients. All the information gathered suggested that the best approach to decrease mortality and morbidity and increase treatment opportunities and improve outcomes is to assess and treat these women in a timely fashion. Therefore, it is important to have an organized process to lessen the panic and confusion. No one expects

that a young pregnant or postpartum woman will be having a stroke; however, strokes have increased significantly in this population and delay in care can be devastating.

The practicum site had no organized plan for evaluation and treatment of pregnant and postpartum women with stroke, no 24-hour CT scan, no neurology backup, no prioritizing or expediting labs for these patients, and no contract with stroke centers for rapid transfer process. The common denominator in all of the reviews and discussion was about timeliness. Therefore, I recognized the gap in practice and the need for collaboration among the team for timely evaluation and treatment of pregnant and postpartum women with strokes.

Timeliness was an important factor in in the decision making when the infrastructure and evidence-based processes were being developed. The protocol includes an algorithm (Appendix A) that was developed from evidence-based clinical practice guidelines that supported and enhanced a step-by-step process for rapid decision making about calling a code stroke. The drug t-PA is the only evidence-based, FDA-approved treatment for ischemic stroke (Elissa, Krass, & Bajorek, 2012); however, not every patient with ischemic stroke is a candidate for t-PA. Because t-PA is a very potent drug and contraindicated in certain circumstances, I developed inclusion and exclusion criteria (Appendix B) based on scientific evidence gleaned from the literature for this project.

Implementation Plan

In preparation for the project go live day and in an effort not to disrupt staff daily work schedule, a scholarly poster was developed to disseminate the information to staff at their convenience. Employees will sign in to show that they have viewed the poster.

Viewing the poster presentation is mandatory for all emergency department staff prior to go live date. After rolling out the project to the emergency department staff, the poster will be made available to other members of the health care team at the facility as well as with updates at new employee orientation

The protocol was developed specifically for this practicum site because this practicum site is committed to excellence in patient care but was lacking an organized plan for stroke care for pregnant and postpartum women. Because stroke care requires a multidisciplinary team, the project was developed as an interdisciplinary care delivery product that will be utilized by the emergency department at this maternity hospital for pregnant and postpartum women presenting with signs of stroke. Hours of operation for stroke care will be 24 hours a day, 7 days a week.

All members of the code stroke response team will carry a beeper (Appendix E). In the event that a code stroke alert is needed, an emergency alert will be called to the hospital operator (PBX) and the hospital operator will send a message via emergency messenger with the location to activate the code team. The operator will log the information in the code book with date, time, and place of code stroke. The operator will also log the information on beeping sheet with date, time, and place of code. When a code stroke is called, all members on the code stroke team will be beeped to that location. The stroke response team for this emergency department is comprised of the emergency department physician or nurse practitioner, the on-call neurologist, emergency department registered nurse, CT scan or magnetic resonance imaging (MRI) team, laboratory, and administrator on site or house supervisor. Senior leadership agreed with

the protocol, endorsed it, and will decide on a time for implementation. This protocol will be useful at this site as well as serve as a tool at other sites in this hospital cooperation as well as other nonstroke-ready facilities in the community that have no clearly defined guidelines for stroke patients.

Evaluation Plan

The plan for evaluation began at the onset of the project development. The plan aligns with the evaluation guidelines from the American Stroke Association. An evidence-based protocol was developed for staff to utilize for rapid identification and calling code stroke in maternity patients. The plan will evaluate the timely provision of care (Table 1) from the time the patient walks in the door to disposition.

The evaluation will be done by a peer through chart review on every code stroke record on the day of treatment after disposition of the patient (Appendix C). A code stroke performance improvement record will be filled out in compliance with the Texas and federal law that protect the confidentiality of the peer-review activities. All records, reports, and proceedings will be considered confidential and privileged and treated as such by all participants involved. Stroke quality measures will be reviewed by the stroke committee monthly. If the stroke measures do not meet the benchmark, they will be presented with an identified action plan. Any quality measures that fall below the goal for two consecutive months will be addressed with a drill down analysis and action plan during the next code stroke meeting. Effective stroke care is all about timely evaluation and treatment; therefore, the evaluation plan is guided by the American Stroke

Association specific recommendations for best results. The stroke team endorsed the evaluation plan and will utilize after practice change implemented.

Implication

Practice

The DNP project was guided by the best evidence available for the development of a code stroke protocol for maternity patients in the emergency department. I led the team of stakeholders and developed a protocol with the purpose to decreasing the guessing game and put an end to the chaos and confusion associated with pregnant and postpartum women exhibiting signs and symptoms of stroke. Knowing the purpose of the project can help staff become engaged because the success of the project depended on connecting the stakeholders to the purpose (White & Dudley-Dudley, 2012). This protocol will empower nurses to act quickly and make the best decision based on the protocol for better outcomes of these patients, thereby impacting positive social change through care that is consistent, efficient, equitable, and safe.

Social Change

Stroke for maternity patients is on the rise, yet the practicum hospital did not have an organized system in place for rapid identification and treatment of these women when needed. As a DNP student, a mother, a grandmother, and a human being, I take a personal interest in creating a consistent collaborative approach to reduce maternal illness and complications due to stroke in pregnancy. Improving the well-being of mothers is one the goals of Healthy People 2020 (2010). Therefore, no woman should die or become disabled because of lack of recognition and treatment of stroke. According to Silver and

Jaigobin (2000), “Stroke related to pregnancy is associated with significant morbidity and mortality” (p. 2948). Recognizing that pregnant and postpartum women are at risk for stroke and having a collaborative approach for rapid evaluation and treatment can give these women a better chance at survival and or decrease disability.

Project Strengths and Limitations

There are many strengths to this DNP project. There is nothing more precious than human lives. In this population, if a stroke is occurring prenatally, it can affect the lives of the mother as well as her unborn child. Having an evidence-based protocol that can improve the health and well-being of pregnant and postpartum women by decreasing mortality and morbidity through early recognition and treatment is a phenomenal win for this specialty and population. Another strength is the collaboration among the health care team at the practicum site as well as the welcoming spirit at nearby primary stroke centers. Before embarking on this project, the practicum site had no stroke protocol, no 24-hour CT scan, no prioritization of laboratory results, and no agreement with neurologist and primary stroke centers. All this is finalized now and will be implemented by the practicum site as determined by them.

Limitation to the project is that the treatment for an acute ischemic stroke is t-PA. Although t-PA has been used extensively and successively in pregnant and postpartum women in foreign countries and to a small extent in the United States, its use remains controversial in pregnant women. However, Zotto et al. (2011), explained that the overall complication rates in maternity patients are similar to nonpregnant patients and therefore t-PA should not be withheld during an acute ischemic stroke in a pregnant woman.

Nevertheless, it is a win if a stroke in progress in this population is recognized quickly and transfer takes place rapidly to a primary or comprehensive stroke center where if not t-PA, then alternative treatment can be performed.

Analysis of Self

This project has helped me gain a tremendous amount of knowledge about strokes and particularly about strokes during pregnancy and postpartum period. What an amazing journey this has been. Being able to use existing knowledge and apply it to improve the outcome of pregnant and postpartum women with symptoms of stroke was very empowering.

As a scholar, I was able to combine the best available evidence with clinical judgment (Terry, 2011) to produce a scholastic code stroke protocol that will be utilized at the facility. Although I will not be personally implementing the protocol, it was such an honor to be part of this team in the quest to review the appropriate literature and gather evidence to be able to improve practice for this patient population. As a DNP student, I was able to advance nursing practice for pregnant and postpartum women by analyzing the literature and generating evidence to guide practice for better outcomes for pregnant and postpartum women with stroke.

As a practitioner, the DNP project was a very challenging experience that gave me the opportunity to master my communication skills to effectively communicate with team members and stakeholders, about my passion for improving the outcomes of pregnant and postpartum women. Because of the wide range of knowledge gained from the sciences and from many years of practice, I was able to quickly and effectively

translate knowledge into practice to benefit pregnant and postpartum women with stroke. Then, with the input of the team and stakeholders, I produced a code stroke protocol (Appendix A), which will be used to rapidly evaluate and treat this population. I was also very involved and engaged in the leadership role to promote care that is safe, equitable, and patient-centered, thereby eliminating health disparities and promoting excellence in practice (American Association of Colleges of Nursing, 2006). The code stroke algorithm, inclusion and exclusion criteria, code stroke lab signage, and evaluation plan were produced and ready to be implemented as set forth by the practicum site.

Summary

Managing pregnant and postpartum women means dealing with women in the prime of their lives and, while they are pregnant, it also means dealing with two lives. How devastating it is to miss the subtle signs and symptoms of stroke or to not have an organized plan to quickly evaluate and treat these women. The evidence clearly showed that time is "brain;" therefore, it is imperative to move quickly and beat the clock. No woman should die or suffer consequences because of lack of guidelines and collaboration among the health care team for rapid assessment and treatment of stroke. Knowing the steps of the algorithm and working quickly can reduce morbidity or mortality in this population because 1.9 million brain cells, 13.8 billion synapses, and 12 kilometers (7 miles) of axion fiber die every minute of an untreated stroke (Saver, 2005). The code stroke algorithm, inclusion and exclusion criteria, code stroke lab sign, and evaluation plan were produced and ready to be implemented as set forth by the practicum site.

Section 5: Scholarly Product for Dissemination

Executive Summary

The practicum facility is committed to exceptional care by continually improving the quality of service and assuring positive outcome. Therefore, it was my mission to work with this facility to ensure all stroke patients receive excellence in acute stroke care by having a consistent method for early recognition and treatment of pregnant and postpartum women with symptoms of stroke.

Stroke in pregnancy is on the rise. This hospital delivers 10,000 babies annually. Therefore, the facility's stroke risk is increased because of the population it serves. Currently there was no organized consistent process for triaging patients with signs and symptoms of stroke. This led to confusion, inconsistencies, and or delay in treatment. It was imperative that patients experiencing symptoms of stroke be triaged quickly and have a process to expedite the evaluation and treatment. These patients cannot be sitting in the waiting room while waiting on their turn to be seen nor should they wait for an extended period of time for Computerized Tomography (CT) scan. Two million brain cells die with every minute during a stroke therefore "time is brain."

Patients with symptoms of stroke need an organized process and an organized team with specific and clearly defined roles. In the event of a patent with symptoms of a stroke the nurse or provider will alert the team for rapid evaluation and treatment of this patient. Time is of the essence in stroke care.

With the collaborative efforts of the leaders and multidisciplinary team and review of best practices, I developed the infrastructure and the evidence-based practice process required to consistently produce high quality stroke outcomes at the facility. A Code Stroke algorithm was developed with step by step instructions as a guide to rapidly assess and alert the team by calling a Code Stroke. Optimal time frames were established and will be monitored for quality improvement purposes.

The medication for acute ischemic stroke for maximum effect has to be given within 3 hours of the onset of symptoms i.e. the last time the person was seen normal. Therefore, for best results the goal is to follow the National Institutes of Health (NIH) recommendation (1) arrival to evaluation within 10 minutes (2) notification of stroke team within 15 minutes (3) arrival to CT scan 25 minutes (4) arrival to interpretation of CT results within 45 minutes (5) arrival to t-PA if indicated 60 minutes (6) arrival to admit 180 minutes and (7) arrival to transfer 2 hours for hemorrhagic stroke and 3 hours for ischemic stroke.

Therefore, on the basis of best practices this DNP student recommend that the hospital take the following steps:

- Twenty-four hours of stroke care a day, seven days a week
- Code Stroke Activation process. "One call does it all"

- Code Stroke Protocol
- Have access to a primary or comprehensive stroke center if required.

Summary

In summary, pregnant and postpartum women are at a disadvantage mostly because of their ages. No one expects a woman in the prime of her life and during one of the most exciting times to experience a stroke and die or suffer consequences. However, based on the pathophysiology of pregnancy, coupled with other comorbidity during pregnancy place these women at risk for stroke. However, when a stroke strikes everyone should be familiar with the steps necessary for best outcomes of these patients. Therefore, this project planner conducted a needs assessment at the practicum site and recognized the opportunities to improve outcomes for these women because there was no consistency with care, no organized plan, delays in recognition and treatment, and delay in transfer. Hence with the assistance of the team, the stakeholders, and review of best practices, a Code Stroke protocol for maternity patients was developed and ready for implementation by the practicum site hospital.

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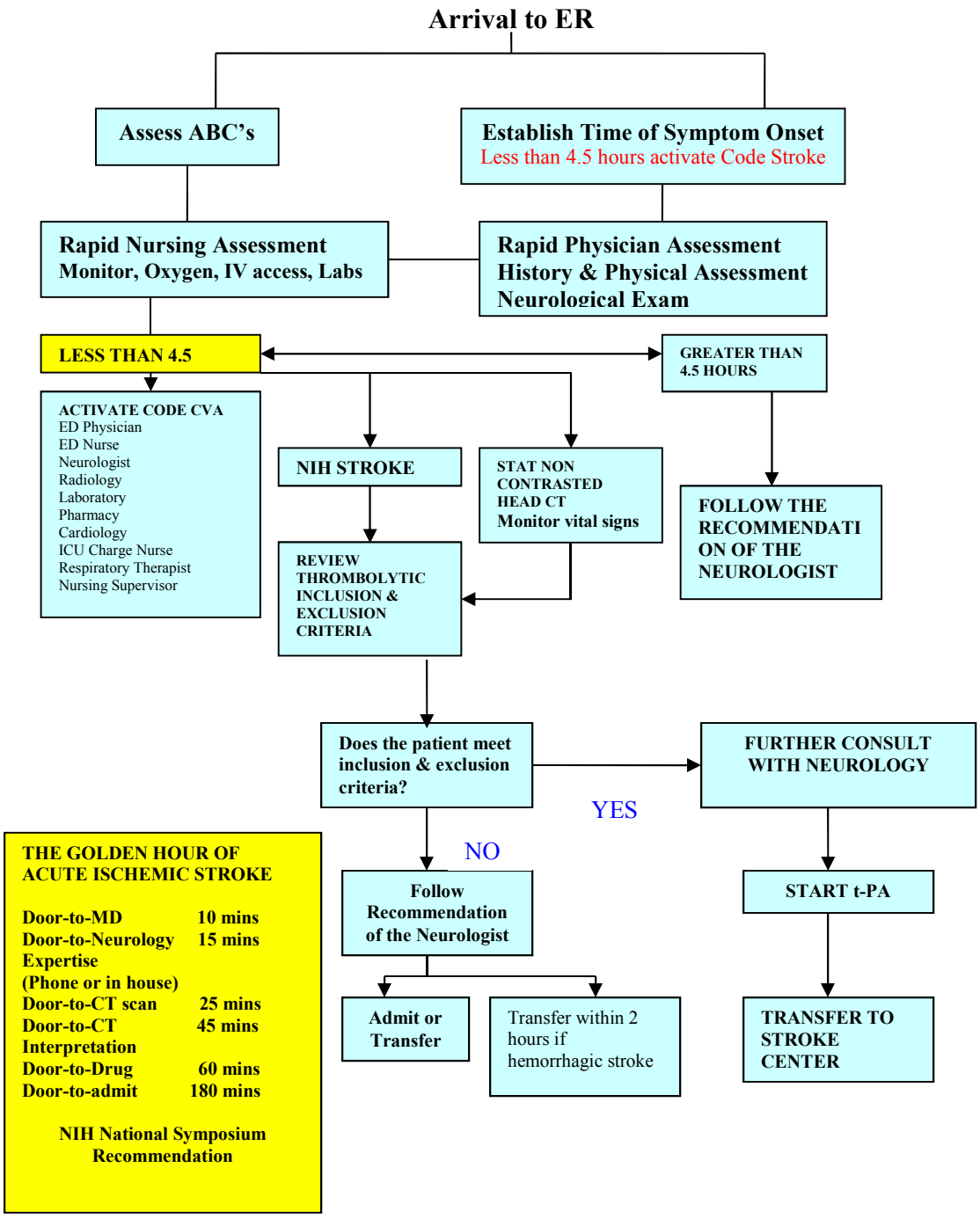
Appendix A: Code Stroke Protocol for Maternity Patients

Guidelines for Management of Acute Stroke



Appendix B: Inclusion and Exclusion Guidelines for Administration of t-PA

Inclusion Criteria

- Ischemic stroke
- t-PA can be administered with 4.5 hours of symptoms onset
- Neurological deficit measured by NIH Stroke Scale
- Clearly defined time of symptom onset
- Age >18 years of age

Exclusion Criteria

- Hypersensitivity to alteplase or any component in the formulation **(absolute)**
- Evidence of acute intracerebral or intracranial hemorrhage on non-contrast CT of the head **(absolute)**
- Pregnancy **(relative)**
- Uncontrolled hypertension, i.e., not reduced to 185/110 or lower within 30 minutes by oral agents, Nitroglycerin paste, Labetalol or Esmolol **(absolute)**
- Rapidly improving or minor neurological symptoms **(absolute)**
- Symptoms suggesting subarachnoid hemorrhage **(absolute)**
- Arterial puncture at a noncompressible site in the past 7 days) **(absolute)**
- Patients with a prothrombin (PT greater than 15 seconds) **(absolute)**
- Patients on Warfarin or other oral anticoagulants (e.g. dabigatran, rivaroxaban, apixaban) with INR greater than 1.7 (**absolute)**
- Early CT evidence of acute infarction **(relative)**
- Acute MI or post MI pericarditis **(relative)**
- Other stroke, serious head trauma, or intracranial surgery in the past three months **(relative)**
- History of intracranial hemorrhage **(relative)**
- Serious medical illness **(relative)**
- Seizure at the onset of stroke **(relative)**
- Major surgery in the past 14 days
- Known bleeding diathesis
- Gastrointestinal or genitourinary tract bleeding in the past 3 weeks
- Intracranial neoplasm, arteriovenous malformation, or aneurysms
- Heparin within the past 48 hours and elevated activated partial thromboplastin time (aPTT)
- Platelet count less than 100,000)
- Serum glucose less than 50mg/dl or greater than 400mg/dl
- Age greater than 80 years (if in the 3 – 4.5-hour window) **(absolute)**
- Baseline NIH Stroke Scale >25, and history of both stroke and diabetes (if in the 3 – 4.5-hour window) **(absolute**)

Other considerations

- Ensure that NIH Stroke Scale has been establish

- Accurately establish time of symptom onset and question the patient, family or other witness to confirm the time of onset accurately
- Vascular access should be performed only as necessary; central venous or arterial punctures should be restricted during the first 24 hours
- Placement of an indwelling bladder catheter should be avoided during the infusion and for 30 minutes thereafter
- Insertion of a nasogastric tube should be avoided for 24 hours after treatment
- Complications of thrombolytic therapy include: bleeding complications, CNS and Non CNS Hemorrhage

t-PA Dose for Acute Ischemic Stroke

- Bolus dose, discard dose, and infusion rate are verified by two clinicians
- Dose: 0.9mg/kg with a maximum does of 90mg
- Ten percent of the dose is given as a bolus dose over one minute
- The remaining dose is given over 60 minutes
- Drug should be administered through a dedicated intravenous catheter site
- Document start time of infusion
- At the end of the infusion, inject 20ml of normal saline into the bad and purge the pump to empty the line of t-PA
- Document end of infusion

Appendix C: Evaluation Plan

Maternity ER Stroke Chart Audit

Date _____ MRN_____

Last time seen normal
1. Less than 3 hours
2. 3 – 4.5 hours
3. Greater than 4.5 hours

Door to MD evaluation 10 minutes or less
1. Yes
2. No

Door to neurological expertise 15 minutes or less
1. Yes
2. No

Door to CT 25 minutes or less
1. yes
2. No

Door to CT interpretation 45 minutes or less
1. Yes
2. No

Does patient meet criteria for t-PA
1. Yes
2. No

Door to drug 60 minutes or less
1. Yes
2. No
3. N/A

Disposition
1 Admit
2 Transfer

Door to Admit
Minutes: _____

Door to Transfer
Minutes: _____

Audit Nurse: _____

Appendix D: Laboratory Signage to Accompany All Blood to the Lab

Appendix E: Code Stroke Team Members Roles and Responsibilities

Team Members	Role/Responsibility
Core Team • Emergency Department Physician and /or Neurologist	• Obtain report from triage nurse, provide team direction, establish priorities for diagnosis and management, screen patent for possible administration of t-PA according to inclusion/exclusion criteria, receive and interpret results of tests/interventions; decide on patient disposition, talk to family, provide team education.
• Emergency Department Nurse	• Intravenous access, Foley placement; perform procedures, treatments as ordered; assess response to treatment; provide emotional support.
• Respiratory Therapist	• Airway assessment; pulse oximetry; assist with intubation and ventilator setup if necessary; obtain blood gases if necessary.
Additional Team Members as Needed • Emergency Department Charge Nurse	• Coordinate flow of care
• Emergency Department Technician	• Assist with patient care
• Emergency Department Clerk	• Registration
Support Staff as Needed • Pharmacist	• Assist with medication management
• CT Technician	• Ensure prompt CT turnaround time
• EKG Technician	• Ensure prompt EKG turnaround time
• Laboratory Technician	• Ensure prompt lab study turnaround time
• Security	• As needed for crowd control