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Stroke Protocol and Patient Outcomes

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STROKE PROTOCOL AND PATIENT OUTCOMES

by

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DEDICATION

I would like to dedicate this evidence-base project report to my husband Andrew and our children; Jon, Douglas and Andrew. Thank you for all of your love and support throughout the years. I love you all.

ACKNOWLEDGMENTS

I would like to acknowledge the good people of Provena St. Mary's Hospital: Rita Morris, Anthony Brunello, and Amy LaFine for allowing me the opportunity to do this project. Without your hard work and dedication in your efforts for improvement in stroke care, this project would not even be possible. I would also like to acknowledge Dr. Pepa, who was my faculty advisor for this project. Finally I would like to acknowledge Olivet Nazarene University and the administration for allowing me to pursue my dream of my DNP.

PREFACE

“Love the Lord your God with all your heart and with all your soul and with all your mind and with all your strength” Mark 12:30

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ABSTRACT

Stroke is the third leading cause of death in the United States, ranking behind “diseases of the heart” and all forms of cancer (American Stroke Association, 2007). It is also a leading cause of serious long-term disability in the United States. Despite these statistics, there is poor knowledge among both the general community and health care professionals about the nature of stroke, signs and symptoms of a stroke, and what to do in the event of a stroke. Early treatment is crucial in maximizing the benefit of stroke intervention. The purpose of this evidence-based project (EBP) at PSMH was to establish clinical practice on the best utilization of scientific guidelines and improve outcomes on patients who come into the hospital with a diagnosis of acute stroke or transient ischemic attack.

Keywords: stroke, transient ischemic attack, protocol, stroke scale, education

STROKE PROTOCOL AND PATIENT OUTCOMES

CHAPTER 1

INTRODUCTION

The role of the advanced practice nurse (APN) at the Doctorate of Nursing Practice (DNP) level is to transform evidence-based research into practice and disseminate this new knowledge to improve health care practices and outcomes. This evidence-based practice (EBP) project will reflect the culmination of knowledge and skills developed throughout the DNP program.

Chapter One is the introduction. This section describes the purpose of this EBP project and introduces the compelling, clinical question presented in the PICO (patient, intervention, comparison, and outcome) format that guides this project. This introduction consists of: (a) background information of the problem, (b) statement of the problem, (c) purpose of the EBP project, and (d) significance of the problem. The PICO question for the EBP project is “In patients 18 years and older coming into the emergency room, (ER) what new interventions in stroke protocol compared to the current interventions will produce better outcomes?”

Introduction

Stroke is the third leading cause of death in the United States, ranking behind “diseases of the heart” and all forms of cancer (American Stroke Association, 2007). It is also a leading cause of serious long-term disability in the United States. The economic burden of stroke on society was estimated to be $65.5 billion in 2008 (Heart Disease and Stroke Statistics, 2008), with direct costs (i.e. hospitals, physicians, rehabilitation, and pharmaceuticals) amounting to $29 billion and indirect costs such as lost of productivity totaling $16 billion annually (Lacy, Suh, Beuno, & Kostis, 2001). Each year about 780,000 people experience a new or recurrent stroke. About 600,000 of these are first

attacks, and 180,000 are recurrent attacks (Heart Disease and Stroke Statistics, 2008). On average, every 40 seconds someone in the United States has a stroke, and on average every three to four minutes someone dies of a stroke (Heart Disease and Stroke Statistics, 2008, p. 31). Despite these statistics, there is poor knowledge among both the general community and health professionals about the nature of stroke, signs and symptoms of a stroke, and what to do in the event of a stroke.

Definition

Stroke can be defined as the sudden development of a focal neurological deficit, which is caused by a thrombotic or embolic arterial occlusion (ischemic stroke) or by a rupture of an artery in the brain or subarachnoid space (hemorrhagic stroke) (Internet Stroke Center, 2008). Approximately 87% of all strokes are ischemic and 10% are intracerebral hemorrhage, and 3% are subarachnoid hemorrhage (Heart Disease and Stroke Statistics, 2008).

Acute stroke is a medical emergency (Gocan & Fisher, 2008). The longer blood flow to the brain is interrupted the greater chance of permanent brain damage. Within minutes, brain cells begin to die. Two million brain cells die every minute during stroke, increasing the risk of permanent brain damage, disability, or death (American Stroke Association, 2009).

Early treatment is crucial in maximizing the benefit of stroke intervention. According to Ross et al. (2007) " incorporating a diagnostic protocol for transient ischemic attack using accelerated diagnostic protocol is more efficient and less costly than traditional inpatient admission compared to traditional inpatient admission" (p. 109). In addition, Brown and Yaste (1994) identified instituting a stroke protocol showed "modest savings in hospitalization cost for patients in relation to decrease in length of stay" (p.1961).

Lastly, Sattin, Olson, Liu, Raman, and Lyden (2006) found that incorporating an expedited stroke protocol is feasible and safe. They looked at onset of signs and

symptoms of stroke to treatment time of Recumbent Tissue Plasminogin Activator (rTPA) and the risk of intracerebral hemorrhage. The authors set a benchmark guideline that showed from onset-to-treatment within two hours on patients that admitted with a diagnosis of acute stroke would prove to be a safe and feasible protocol. A total of 781 patients were in the study; 103 (13.2%) were treated with intravenous rTPA within three hours. Of the 103, 49 (47.6%) were treated within two hours of symptom onset, and 54 (52.4%) were treated between two and three hours. The overall risk of symptomatic intracerebral hemorrhage was 4 of 103 (3.9%; 95% CI, 1.1%). The hemorrhage risks in those treated within two hours of symptom onset and those treated between two and three hours were not significantly different from each other or from 6.4%.

Recently the American Stroke Association (ASA) (2007) developed a “Stroke Chain of Survival” that specified action areas for maximizing poststroke functioning. The three areas that focused on decreasing prehospital delays were (a) symptom recognition, (b) calling emergency medical services (EMS), and (c) rapid response by EMS. The other focus area was on timely diagnosis and treatment of Recumbent Tissue Plasminogen Activator (rTPA).

Statement of the Problem

According to Illinois HB2244 Section 5.719, a revision to The Emergency Medical Services (EMS) System Act (2007), hospitals must have a designated trauma center that is a certified stroke center close to them to care for patients with stroke “like” symptoms. According to the EMS System Act of 2007, “Trauma centers that are seeking designation as a certified stroke center shall develop policies and procedures that consider nationally-recognized, evidence based protocols for the provision of emergent stroke care” (p. 12). This is to be effective by July 1, 2010.

In addition to Illinois state law designating certain trauma centers as certified stroke centers, the Center for Medicare and Medicaid Services (CMS) (2009) recently released

its fiscal year 2010 Medicare Inpatient Prospective Payment System (IPPS) Proposed Rule. The rule describes CMS future plans for payment, quality measurement, and other important issues related to inpatient hospital care. The aspects of the proposed rule are twofold.

One, CMS has proposed using a set of eight stroke measures in the Medicare Reporting of Hospital Quality Data for Annual Payment Update (RHQDAPU) program in fiscal year 2010. The eight measures are as follows: (a) Deep vein thrombosis (DVT) prophylaxis by end of hospital day two, (b) discharge on antithrombotic therapy, (c) patients with atrial fibrillation/flutter receiving anticoagulant therapy, (d) thrombolytic therapy, (e) antithrombotic therapy by end of hospital day two, (f) discharged on statin medication, (g) stroke education, and (h) assessment for rehabilitation (Centers for Medicare and Medicaid, 2009).

The second portion of the proposed rule has CMS adding a structural measure intended to assess the characteristics and capacity of a hospital to deliver quality stroke care. The proposed rule would ask the hospital to report whether they participate in a systematic clinical database registry for stroke care. One of the registries that CMS recommends instituting is Get With the Guidelines-Stroke (GWTG-Stroke). The ASA developed these evidence based guidelines to ensure continuous inpatient hospital quality improvement of acute stroke treatment.

GWTG-Stroke is an evidence-based program for inpatient hospital quality improvement. In addition, GWTG-Stroke ensures that the care healthcare professionals provide to stroke patients is aligned with the latest scientific guidelines and, therefore, improves patient outcomes.

Data from the Agency

Provena St, Mary's Hospital (PSMH) is a Level Two Trauma Center in Region nine, located in Kankakee, IL. It is one of two trauma centers located in the region that is

eligible to be designated as a certified stroke center. The Joint Commission is the governing body that grants trauma centers the designation of certified stroke center.

In 2003, there were a total of 69 deaths resulting from cerebrovascular disease or stroke in Kankakee County (Illinois Department of Public Health Statistics, 2003). At the beginning of this evidence-based project, PSMH had no stroke protocol in place. In order to be recognized as a certified stroke center for the region, PSMH had to develop a stroke protocol based on evidence-based guidelines to evaluate and treat stroke patients and improve patient outcomes.

The mission and purpose of PSMH in establishing a Stroke Certification Center is: "To reduce disability and death from cardiovascular disease and stroke through exceptional medical management while promoting primary and secondary stroke prevention through education to our community and health care providers" (R. Morris & T. Brunello, personal communication, July, 2009).

Provena St. Mary's Hospital (PSMH) saw 93 patients in 2008 with the International Classification of Diseases (ICD-9) codes 433, 434, 435, and 438 (Heart Disease and Stroke Statistics, 2008). PSMH is in a position to be the leader in the community to provide evidence-based practice utilizing safe guidelines to improve outcomes for patients with a diagnosis of acute stroke (ischemic and thrombotic), and transient ischemic attack (TIA).

Purpose of the EBP project

The purpose of this evidence-based project (EBP) at PSMH was to establish clinical practice based on the utilization of scientific guidelines and to improve outcomes of patients who come into the hospital ER with a diagnosis of acute stroke or transient ischemic attack.

The PICO question addressed by this project was: “In patients 18 years and older coming into the emergency room, what new interventions in stroke protocol compared to the current interventions will produce better outcomes?”

Significance of the project

The goal of this EBP project was to (a) ensure that patients with a diagnosis of acute stroke are cared for through best practices, (b) decrease length of stay, (c) improve patient outcomes, and (d) comply with CMS and Illinois state guidelines. In addition, PSMH would be an accredited stroke certification center.

CHAPTER 2

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

Chapter Two explains the theoretical framework and contains the review of literature. The theoretical framework provides the structure and guides the interventions for the EBP project. In addition, this section will address the best available literature to help answer the PICO question: “In patients 18 years and older coming into the Emergency Room, what new interventions in stroke protocol compared to the current interventions will produce better outcomes?” The evidence is then critically appraised for its validity, quality, and generalizability.

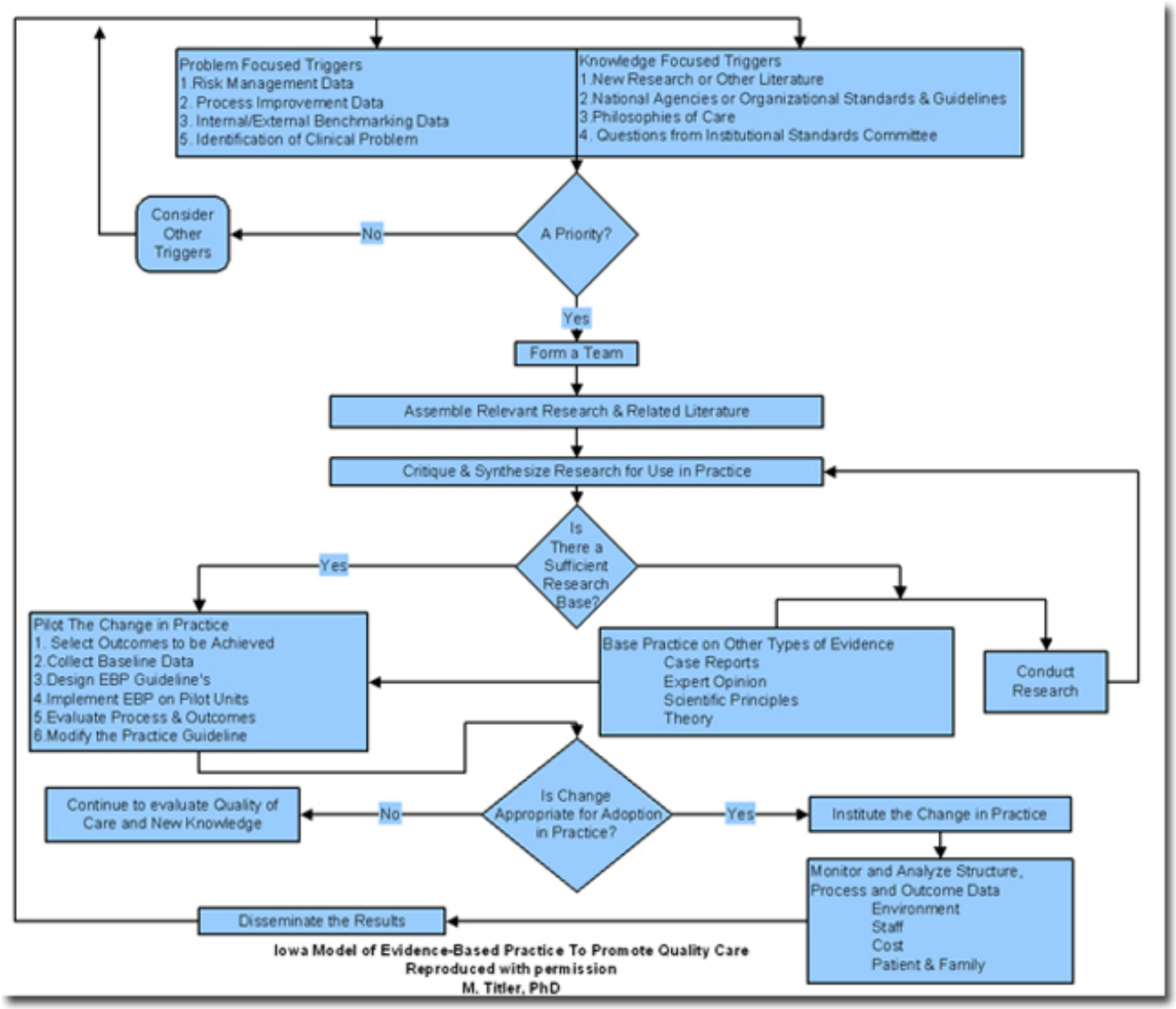
Theoretical Framework

The theoretical framework that this researcher used to guide this evidence-based project was a combination of the Iowa Model and Kurt Lewin’s Three-Step Change Framework. The Iowa Model provided the structure for the project and Kurt Lewin’s Three Step Change Framework guided the intervention.

Iowa Model

The Iowa Model is a revision of the Iowa Model of Research-Based Practice to Promote Quality Care (Melnyk and Fineout-Overholt, 2005). It was developed at the University of Iowa Hospital and served as a framework to improve patient outcomes, enhance nursing practice, and monitor health care costs (Taylor-Piliae, 1999) (Figure 2.1). The model was an outgrowth from a quality- assurance model, which served to motivate investigation or examination of quality-improvement measures. Furthermore, the Iowa Model aids the application of empirical evidence to clinical practices through a realistic and efficient approach to promote the establishment of evidence-based nursing practice (Taylor-Piliae, 1999).

Figure 2.1 Iowa Model



The model has several steps that facilitate problem identification and solution development as it relates to incorporating evidence findings into practice. The first step in the Iowa model is to identify either a problem or a knowledge-focused trigger, which serves as a channel for nurses to search and evaluate the existing scientific evidence.

The second step in the model is to gather relevant research and related literature, critique, and synthesize research for use in practice. If there is enough research, then the nurse will incorporate a change in practice. If there is not enough literature in the research base and is not sufficiently developed to guide practice; then the nurse will conduct research, consult with an expert, or determine what scientific principles will be needed for the research (Taylor-Piliae, 1999).

The third step in the model is evaluation. If there is a change that is appropriate for adoption into practice, then change will occur in practice. If the change is not appropriate for adoption into practice, the nurse will continue to evaluate research studies for clinical relevance to guide nursing practice.

The fourth and final step is to implement the recommended changes and to evaluate the outcomes of the change in practice patterns.

The Iowa Model was a perfect fit for this particular evidence-based project because it facilitated a problem identification and solution development as it related to incorporating evidence-based findings into practice.

According to the Iowa Model, incorporating the stroke protocol at PSMH started at the knowledge-focused trigger. A knowledge-focused trigger stems from new or freshly recognized information. Important sources are standards and practice guidelines available from national agencies and organizations (Tilter et al., 1994). Get With the Guidelines-Stroke are a set of national recognized guidelines from the ASA that ensures the care healthcare professionals provide to stroke patients is aligned with the latest scientific guidelines and therefore improves patient outcomes.

The Iowa Model has been utilized in multiple research projects on various levels. (Tilter et al.,1994, p.312). The only limitation that this researcher identified in using the Iowa Model for this project was the lack of publications utilizing the model in the care of acute stroke patients.

Three-Step Change Framework

Kurt Lewin's classic three-step change framework of: unfreezing, moving, and refreezing will be used to guide in the educational portion of the project (Figure 2.2).

According to Lewin (1951), the first stage of this model, unfreezing, occurs when the person is becoming motivated to change. In addition this stage involves creating an awareness of the need for change and removing any resistance to change.

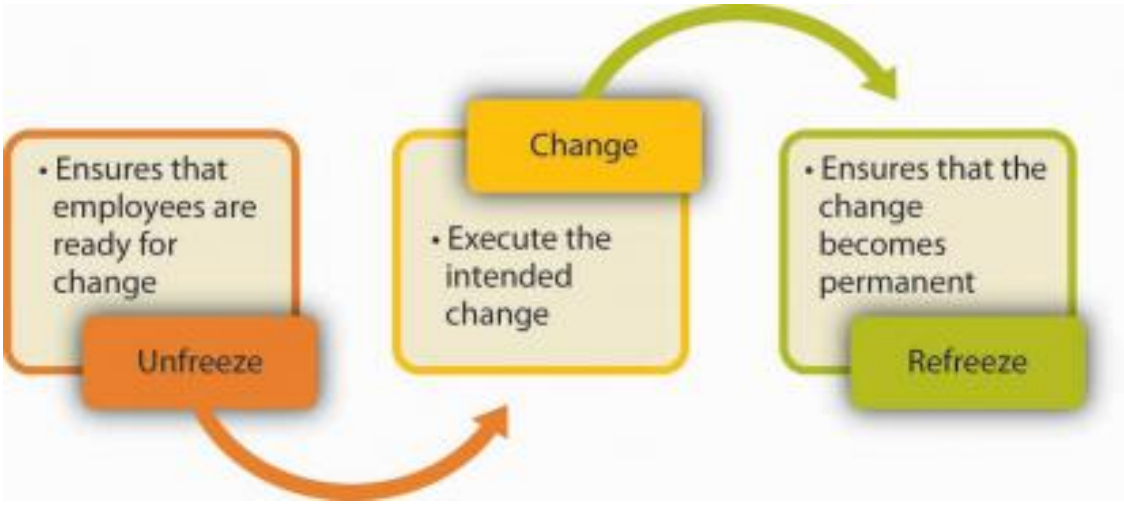
Moving is the second stage of the model. Moving involves putting new strategies, structures, or practices into place. This stage often requires organizational members to accept new ideas, attitudes, and behaviors (Lewin, 1951).

The last stage is refreezing. This final stage involves stabilizing the change by integrating the newly adopted strategies, structures, and practices into existing operating procedures and work routines (Lewin). A limitation of this model is that there are no recent studies published using Kurt Lewin's Theory.

Literature Search

A comprehensive review of the literature between the years 2000 to 2009 was conducted using Medline, CINAHL, and Cochrane databases. The search included both full text and citation only articles. The search strategy comprised of the following terms separately or in combination: "cerebrovascular accident", "stroke or strokes", "stroke scale", "assessment, nursing", "practice guidelines", " best practice guidelines", and

Table 2.2 Kurt Lewin's Three-Step Change Framework



Retrieved April 15, 2010 from www.flatworldknowledge.com

"evidence-based guidelines." Pediatric papers were excluded. Inclusion criteria were: (a) written in the English language, (b) focused on adults, (c) published between the years 2000-2009, and (d) included protocol for stroke patients. The search yielded 3,323 articles: (a) 1,752 from Medline, (b) 1,126 from CINAHL, (c) I 440 from PubMed, and (d) five from Cochrane Database. The search engine "Google Scholar" was used to identify literature that was not found in the review. The articles were selected on the basis of their title and abstract. In case of uncertainty, the entire text of the article was read. This researcher reviewed 30 articles and found only 12 met inclusion criteria. The main reason for rejection was lack of protocol description.

The selected articles were evaluated for study quality according to the methods outlined by Melynyk and Fineout-Overholt (2005). The methods included: study type, level of evidence, and appraisal of the articles (Table 2.1).

Description of the literature

By far the most common research designs were (a) quantitative descriptive (n=7), (b) systematic review (n=2), (c) quality improvement (n=2), and (d) educational presentation (n=1). Sample sizes ranged from 70 to 15,117. Many studies did not indicate who was responsible for responsible for recruitment into the study.

Evidence-Based Literature

"Organized stroke care" using evidence-based protocols and interdisciplinary teams have demonstrated a reduction in stroke mortality, morbidity, hospital costs, and the need for long-term care. The administration of the "clot-busting" drug rTPA within the three-hour window can minimize or reverse the effects of an ischemic stroke (Schwamm et al, 2005, p.691).

Most studies have explored the impact on accuracy of stroke recognition by EMS, stroke symptoms and the decision to call an ambulance, and predictors of time from hospital to initial brain-imaging among suspected stroke patients. There is little

experimental research that has explored the impact in clinical practice and current best practice guideline recommendation for acute stroke patients and emergency room nurses. Table 2.1 lists the relevant studies reviewed for this project and their respective level of evidence.

In a quantitative study by Ramanujam et al. (2008), the authors assessed the accuracy of stroke identification between emergency medical dispatchers (EMD) using the Medical Priority Dispatch Systems (MPDS) stroke protocol and emergency medical services (EMS) paramedics using the Cincinnati Prehospital Stroke Scale (CPSS). They found that EMD using MPDS stroke protocol had a higher sensitivity (83% with a positive predictive value of 42%) compared to EMS using the CPSS (44% sensitivity and a positive predictive value of 40%). Additional evidence from this article supports the use of increasing the knowledge retention and frequency for training sessions for EMS personnel. A major limitation of this study was the design. This was a retrospective study in that the researchers did not follow all medical aid calls to determine the outcomes. The authors stated that a limitation of the study was the incompleteness of the databases. The EMDs did not always record their assessments in the computer; therefore, there were missing data. On the other hand, a strength of the study was the large number of patients, 440.

Rodin, Saliba, and Brummel-Smith (2005) conducted a systematic review of randomized clinical trials, clinical trials, and systematic reviews investigating evidence-based processes of poststroke care to improve patient outcomes. On the basis of these rigorous studies, Rodin et al. (2005) concluded that the importance of providing rehabilitation in a “coordinated and organized” setting was important for improved patient outcomes. The only limitation that this researcher found was the fact that the findings were only applicable to the VA system and not generalizable to other facilities.

Table 2.1

Levels of evidence for the appraisal of literature

Author(s)	Level of evidence	Key evidence
Edwards (2006)	Level V	Continued education improved patient outcomes, interactive workshops alone or in groups and physiotherapy-led programs help decrease patient complications and length of stay.
Gocan & Fisher (2008)	Level VI	Implementing the NIHSS stroke scale to nurses increases proficiency in critical thinking, monitoring trends in patients, patient risk assessment, problem solving, and scope of practice.
Lacy et al. (2001)	Level VI	There still needs to be more effective health programs to minimize the evaluation time and treatment of stroke.
McNamara et al. (2008)	Level VI	Results played a key role in development of a state protocol for EMS personnel in the treatment of the acute stroke patient
Mosley et al. (2007)	Level VI	Paramedic stroke recognition and hospital pre-notification account for shorter times and delays in treatment for the acute stroke patient.
Mosley et al. (2007)	Level VI	Programs need to be aimed at increasing stroke awareness, especially in middle-age group.

Levels of evidence for the appraisal of literature cont'd

Author(s)	Level of evidence	Key evidence
Nor et al. (2004)	Level VI	The FAST test is just as accurate as a neurological assessment from the ED Physician's assessment.
Ramanujam et al. (2008)	Level V	Incorporating an MPDS protocol, paramedics were able to identify stroke patients more efficiently, expedited transport and management of stroke patients.
Rodin et al. (2005)	Level VII	Adhering to guidelines improve functional status measures as the primary outcome in the rehabilitative phase of an acute stroke.
Rose et al. (2008)	Level IV	Patients arriving within two hours of the onset of acute stroke like symptoms had better outcomes than those who did not.
Sattin et al. (2006)	Level IV	An expedited stroke protocol is safe and feasible to do
Stoeckle-Roberts et al. (2006)	Level VII	Clinically and statistically improvements can be made in the acute stroke patient care using a collaborative and systematic approach to QI that incorporates protocol utilization.

Note: Level 1: Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs), or evidence-based clinical practice; Level II: Evidence obtained from at least one well-designed RCT; Level III: Evidence obtained from well-designed controlled trials without randomization; Level IV: Evidence from well-designed case-control and cohort studies; Level V: Evidence from systematic reviews of descriptive and qualitative studies; Level VI: Evidence from a single descriptive or qualitative study; Level VII: Evidence from the opinion of authorities and/or reports of expert committees (Melnyk & Fineout-Overholt, 2005, p.10).

Edwards (2006) conducted a systematic review on the content and delivery of educational programs for nurses on stroke units and how it impacted their practice and influenced patient outcomes. The results of the study supported a recurrent theme in the literature demonstrating a concern nurses have about the extra time required to adopt a more therapeutic approach. The biggest limitation of the review was the failure to consider the effects of successful leadership on a nursing unit and its impact on change. (p. 1183).

Rose, Rosamond, Huston, Murphy, and Tegler (2008) found that stroke recognition among EMS personnel and EMD and time of onset of symptoms are important in decreasing morbidity and improving patient outcomes. The authors examined predictors of patient's arrival to the hospital to initial computerized tomography (CT) of the head. According to the authors, the result of the study showed that arrival to the emergency room by EMS compared to other modes of transportation was the strongest predictor of door to CT scan (p. 3263). This study's major limitation was data recording; the researchers collected data from time CT scan was done and not read. However, the fact that data were collected concurrently, which allowed the researchers to ascertain how clinical impressions and initial diagnosis influenced the prompt diagnosis and treatment of stroke, was the strength of the study.

Mosley, Nicol, Donnan, Patrick, and Dewey (2007) conducted a prospective observational study to isolate factors that influenced the decision to call for ambulance assistance after onset of symptoms. Results of the study showed that: (a) speech problems (41%), (b) limb weakness (38%), (c) altered consciousness (28%), (d) fall (17%), (e) facial droop (11%), and (f) numbness (9%) were reasons that patients identified for calling assistance. Early recognition of acute stroke symptoms seems to be critical to enhance patient outcomes. According to the researchers, interventions are needed to more strongly link stroke recognition to immediate action to increase the

number of stroke patients eligible for acute treatment (p. 365). Since responses to stroke were recorded concurrently and not retrospectively, memory did not influence the study.

Evidence-based secondary stroke prevention treatments (i.e. antiplatelet treatment) are consistently underused, indicating a need to improve the quality of acute stroke care.

Stocke-Roberts et al. (2006) reported that instituting a quality improvement (QI) intervention to improve hospital care provided to acute stroke and TIA patients can improve patient outcomes. This can be achieved by using a collaborative and systematic approach to quality improvement (QI) that utilizes protocol utilization and ongoing data collection and review. A change in any particular performance measure was influenced by the degree to which processes needed to be changed. A limitation of the study was the length of time from the initiation of the stroke protocol to the reassessment period (6 months).

Lacy et al. (2001) conducted a quantitative descriptive study to evaluate delays in time of onset of signs and symptoms of acute stroke and seeking care. Data were retrospectively collected from 553 charts. The researchers found that delays in arrival were significantly associated with gender, race, transportation mode, and history of cardiovascular disease (p. 68). Lacy et al. (2001) identified potential sampling and measurement errors documenting time of stroke onset at the emergency department (ED), especially for patients who were awakened with neurological symptoms. The researchers included patients who arrived at study hospitals with stroke symptoms, rather than randomly throughout the year, preventing assessment of seasonal variations and the effect of inclement weather on arrival time to the ED.

In addition, Mosley, Nicol, Donnan, Patrick, Kerr et al (2007) performed a quantitative prospective open observational study to evaluate factors associated with rapid medical assessment in the emergency department after a call for ambulance and to determine

the impact of ambulance practice on times from that ambulance call and the first medical assessment in the emergency department. They found that EMS stroke recognition and hospital prenotification were associated with shorter times from the ambulance call to first medical assessment. This study identified that time from ambulance call to first medical assessment in the ED and the time from hospital arrival to first medical assessment may both be directly influenced by paramedic practices when the receiving hospital has rapid response protocols for patients with acute stroke protocol in place.

Morris, Rosamond, Madden, Schultz, and Hamilton (2000) evaluated patient delays in seeking care after a stroke and delays in diagnostic studies in the ED. The authors of the research discovered that patients with a diagnosis of acute stroke arriving by EMS had significantly shorter prehospital delay times (2.6 hours) and time to CT completion (1.1) hours than patients arriving by private automobile. There were several limitations to this study; first 483 patients were ineligible for the study due to missing data from their charts, leaving 724 eligible participants. Another limitation was that all of the EDs were involved in at least one clinical trial on acute stroke care. Morris et al (2000) posited that this may have altered their approach to stroke patients (p. 2588). Lastly, stroke severity was not measured, even though this may altered times to CT completion.

McNamara et al. (2008) conducted a descriptive study on stroke knowledge between urban and frontier first responders. A total of 988 EMS personnel from both urban and frontier areas completed a survey of 71 questions. Findings of the study demonstrated that frontier EMS were less likely to use stroke protocol (58%) compared to urban EMS (66%). Frontier EMS were also less likely to use a stroke screening tool (36%) than their urban counterparts (47%). McNamara et al. (2008) identified three limitations in the study. One, self-reported information regarding stroke knowledge and care were collected, which may not have been accurate. Second, the authors thought that there were differences in knowledge and practice between the two study groups. Finally, their

findings could not be generalized to all EMS providers. In addition, the authors stated that this was just part of a larger study.

Nor et al. (2004) evaluated paramedic accuracy in detecting acute stroke symptoms using the Face Arm Speech Test (FAST) compared to the physician assessment. A total of 278 patients were admitted into the study. Recognition of neurological deficits by ambulance paramedics using the FAST showed moderate to excellent agreement with stroke physicians. Results supported using the FAST test as a reliable tool for prehospital diagnosis of acute stroke. The strength of this study was the fact that it was the first clinical practice (non-experimental) study, in which the ability of ambulance paramedics were able to detect specific neurological signs in acute stroke patients.

Finally, Sattin et al. (2006) evaluated an expedited stroke protocol with benchmark onset to treatment time within two hours of onset of symptoms to infusion of rTPA. The aim of this study was to demonstrate the safety and feasibility of the protocol. They found that the overall risk of symptomatic intracerebral hemorrhage was not significantly different in those treated within two hours of symptom onset and those treated between two and three hours. Sattin et al. (2006) identified several limitations of the study. One, demographic, baseline, and process of care data were only available for a subset of their patients because of the learning curve associated with implementing a new database. This subset may not be representative of the population. A strength of the study was the large sample size of 781 patients.

The significance of the appraisal of literature reviewed indicated that there is a gap in research on emergency room nurses and their ability to recognize acute stroke symptoms and how to assess the patient. Assessment is an essential nursing skill that gathers clinical information to strengthen decisions about interventions and priorities inpatient care delivery. Neurological assessment of the acute stroke survivor provides

the cornerstone for early diagnosis, appropriate prognostic evaluation, and optimal management to obtain favorable patient outcomes (Gocan & Fisher, 2008).

Construct EBP

The National Institutes of Health Stroke Scale (NIHSS) is a standardized stroke scale that nurses can use to objectively and quantitatively assess stroke survivors (Gocan & Fisher, 2008 p. 34). The NIHSS stroke scale was taught to all staff nurses in a face to face forum and through a computer based learning module (Appendix A).

In 2007 American Stroke Association established the GWTG-Stroke. These guidelines were developed to ensure continuous quality improvement of acute stroke treatment and ischemic stroke prevention. It focuses on team care protocols to make sure that patients are treated and discharge properly (ASA, 2009). The guidelines are as follows: (a) Deep vein thrombosis (DVT) prophylaxis by
end of hospital day two, (b) discharge on antithrombotic therapy, (c) patients with atrial fibrillation/flutter receiving anticoagulant therapy, (d) thrombolytic therapy, (e) antithrombotic therapy by end of hospital day two, (f) discharged on statin medication, (g) stroke education, and (h) assessment for rehabilitation.

In order for Joint Commission to grant PSMH as a Stroke Certification Center, two important pieces of the process have to be in place; (a) education of the nurses with the NIHSS stroke scale and (b) Stroke Protocol has to be incorporated (Appendix B).

According to Schwamm, et al (2005), stroke certification begins with the development of a primary stroke center to strengthen acute stroke care. The Institute of Medicine (IOM) of the National Academy of Science has concluded that the fragmentation of the delivery of healthcare services frequently results in suboptimal treatment, safety concerns, and inefficient use of healthcare resources. “To ensure that scientific knowledge is translated into practice, the IOM has recommended the establishment of coordinated systems of care that integrate preventative and treatment services and

promote patient access to evidence-based care" (p. 691). A primary stroke center should coordinate and promote patient access to services associated with stroke treatment, prevention, and rehabilitation.

CHAPTER 3

METHOD

This section will lay the ground work to answer the PICO question: “In patients 18 years and older coming into the emergency room, what new interventions in stroke protocol compared to the current interventions will produce better outcomes?” This section consists of the: (a) design, sample, and setting, (b) measurement outcomes, (c) measurement instruments, (d) implementation of practice change, (e) protection of human rights, and (f) management of data.

Design

The design for this evidence-based project was quantitative and descriptive. The convenience sample was taken from a small Midwestern hospital. The sample consisted of charts of patients over the age of 18 who came into the emergency room with a diagnosis of acute stroke or TIA. The inclusion criteria consisted of: (a) all patients who were first evaluated in the ER and given the primary diagnosis of acute stroke or transient ischemic attack by a board certified emergency room physician, (b) English speaking, (c) over the age of 18, and (d) have no prior cognitive impairment. The initial ED evaluation included: (a) medical history and physical examination, (b) an electrocardiogram, (c) cardiac monitoring, (d) CT of the brain, and (e) laboratory panel (i.e. Complete Blood Count with differential, Comprehensive Metabolic Panel, Protime, International Normalized Ratio, Partial Thromboplastin Time, and Cardiac Enzymes). Patients not eligible to be in the project had a diagnosis of a persistent neurological deficit upon admission unrelated to stroke. Target sample for this project was 30. Patients admitted to PSMH with the primary diagnosis of acute stroke or TIA were placed in either an intensive care unit (MICU or SICU) or a regular telemetry unit bed based on the severity of the stroke.

Measurement Outcomes

The outcomes that were measured were to: (a) ensure that patients with a diagnosis of acute stroke are cared for through best practices, (b) decrease length of stay, (c) improve patient outcomes, and (d) comply with CMS and Illinois state guidelines. In addition, PSMH will be an accredited stroke certification center.

Measurement Instrument

The NIHSS stroke scale is a quantitative measure of stroke related neurological deficit with established reliability and validity for use in prospective clinical research. Kasner et al. (1999) conducted a retrospective study to determine if the NIHSS stroke scale could be used from medical records. They found that the inter-rater reliability was excellent, with an intra-class correlation coefficient of 0.82. Scores were well calibrated among the six raters. Estimated NIHSS scores closely approximated the actual scores, with a probability of 0.86 of correctly ranking a set of patients according to 5-point interval categories (as determined by the area under the receiver-operator characteristic curve). Patients with excellent outcomes (NIHSS score of $\leq$ 5) could be identified with sensitivity of 0.72 and specificity of 0.89. There were no significant differences between these parameters at admission and discharge (p. 1536).

Implementation of Practice Change

The certification of a primary stroke center at PSMH occurred in two phases. The first phase occurred in implementing NIHSS education. Education consisted of all nurses working in ER, medical intensive care unit (MICU), surgical intensive care unit (SICU), and telemetry units attending a four hour workshop on the use of the NIHSS stroke scale. The workshop consisted of watching a 30 minute video on the appropriate use of the NIHSS stroke scale. After completion of the video, the nurses completed an on-line stroke certification through the American Stroke Association website. Once the nurses

successfully completed the certification, they were certified for one year in stroke education. All nurses achieved 100% attendance and certification in stroke education.

The second phase initiated stroke rounds. During this phase, this researcher did daily audits on the charts of patients who were admitted to the hospital with the primary diagnosis of acute stroke or transient ischemic attack. This was to ensure that nurses were initiating the NIHSS stroke scale in their documentation as well as adhering to stroke protocol (Appendix C).

Procedure

After obtaining approval for conducting the project from the agency (a small Midwest Hospital) and the institutional review board (IRB) at Valparaiso University, this DNP student sought a convenience sample of patient charts that met study criteria. This investigator took care to protect the patient's rights during data collection. Patient confidentiality was maintained at all times during data collection. No patient identifiers were used during data collection. Data were reported in the aggregate so no responses could not be connected to individual participants and was locked in a cabinet. Data were coded with only the investigator able to link names and codes. Data were collected through Midas database for stroke patients. No patient contact was initiated.

Data Analysis

In order to compare data between the two groups, an independent-samples *t*-test was performed comparing LOS and age between pre-protocol and post-protocol groups. A Chi-square test was used to compare pre-protocol and post-protocol outcomes in patients discharged on antithrombotic and anticoagulant therapy. In addition, descriptive statistics were analyzed between the pre-protocol and post-protocol groups to determine if the protocol was followed. Data were analyzed using the Statistical Package for the Social Services (PASW).

CHAPTER 4

FINDINGS

This chapter includes the sample characteristics and changes in outcomes. The findings section explains the quantitative descriptive information created from statistical tests performed. The data were reflective of the purpose of the EBP project addressed the PICO question. The PICO question was: "In patients 18 years and older coming into the Emergency Room, what new interventions in stroke protocol compared to the current interventions will produce better outcomes?" The outcomes that were measured in the pre-protocol and the post-protocol groups were to: (a) ensure that patients with a diagnosis of acute stroke are cared for through best practices, (b) decrease length of stay, (c) improve patient outcomes, and (d) comply with CMS and Illinois state guidelines. In addition, when the protocol was in place, PSMH would be an accredited stroke certification center.

Sample

The EBP project took place at a small Midwestern hospital in Illinois. A convenience sample of 24 patients was obtained from November 2009 until February 2010. Although the target number of participants was 30, fewer numbers of patients were admitted to the hospital with a diagnosis of acute stroke during the data collection period. Characteristics of the pre-protocol and post-protocol groups are shown in Table 4.1. The mean age in the pre-protocol group was 69.4 years and in the post-protocol group was 65.9 years. A *t*-test showed no significant difference between the two groups (t (22) = .502, $p > .05$). The mean age between the two groups was 64.9 years. The majority of the sample was male *(n*= 15, 62%). Sixty-six percent were Caucasian (*n*=16), and 33% were African-American (*n*= 8). There was an equal amount of Caucasians between the pre-protocol and the post-protocol group. However, there were more African Americans

Table 4.1 Descriptive Characteristics of Stroke Patients

Characteristic	Pre-Protocol	Post-Protocol
Age (mean=64.9)		
< 54 y	2 (14)	3 (30)
55-64 y	5 (35)	2 (20)
65-74 y	2 (14)	2 (20)
75-84 y	3 (21)	1 (10)
>85 y	2 (14)	2 (20)
Gender		
Female	6 (42)	3 (30)
Male	8 (57)	7 (70)
Race		
Caucasian	8 (57)	8 (80)
African American	6 (42)	2 (20)
Payor Source		
Commercial	3 (21)	1 (10)
Medicare	9 (64)	6 (60)
Medicaid	0 (0)	3 (30)
Uninsured	1 (.07)	0 (0)
Medicare/Medicaid	1 (.07)	0 (0)
Type of Stroke		
Ischemic	13 (93)	10 (100)
Hemorrhagic	1 (.07)	0 (0)
History		
Stroke	1 (.07)	3 (30)
TIA	1 (.07)	2 (20)
Atrial Fibrillation	2 (14)	0 (0)
Hypertension	11 (78)	4 (40)

Values in parentheses are percent

in the pre-protocol group (*n*= 6) compared to the post-protocol-group (*n*= 2). Payer sources were as follows: (a) Medicare (62%, n=15), (b) Medicaid (.08%, *n*=2), (c) commercial insurance (16%, *n*= 4), and (d) uninsured (.08%, *n*=2). The primary payer source of both groups was Medicare. However, there were more Medicaid patients in the post-protocol group. The most common type of stroke between the two groups was ischemic (n= 23, 95%). Past medical history included: (a) cerebrovascular accident (CVA) (n=4, 16%), (b) transient ischemic attack (n= 3, 13%), (c) atrial fibrillation (n=2, .08%), and (d) hypertension (n=15, 62%). The most common health condition between the two groups was hypertension (*n*=15). However, hypertension was higher in the pre-protocol group (*n*=11) compared to the post-protocol group (*n*=4).

Results of the data collected on the pre-protocol and post-protocol groups are described in Table 4.2. The average length of stay (LOS) in the pre-protocol group was 6.2 days compared to 4.3 days in the post-protocol group. This showed a decrease in LOS by 1.9 days. Deep vein thrombosis (DVT) prophylaxis by day two in the pre-protocol group was 100% (*n*=14) compared to 90% (*n*=9) in the post-protocol group. There was only one patient who received intravenous thrombolytic therapy in either pre-protocol group or post-protocol group. Eighty-five percent of the pre-protocol group received antithrombotic therapy on Day 2 compared with 100% in the post-protocol group who received this therapy. Patients discharged on antithrombotic therapy in the pre-protocol group was 80% (*n*=12) compared to the post-protocol group which was 100% (*n*=10). Patients discharged on anti-coagulant therapy in the pre-protocol group was .06% (*n*=1) compared with 0% in the post-protocol group. A chi-square of independence was calculated comparing the result of pre-protocol and post-protocol groups discharged on antithrombotic and anticoagulant therapy. No relationship was found between the two groups discharged on antithrombotic and anticoagulant therapy respectively ($x^2(1) = 1.558$, $p > .05$ and $x^2(1) = .745$, $p > .05$). Patients discharged on

Table 4.2 Pre-Protocol Group vs. Post-Protocol Group

Variable	Pre-Protocol Yes	Pre-Protocol No	Post-Protocol Yes	Post-Protocol No
DVT Prophylaxis by Day 2	14 (100)	0 (0)	9 (90)	1(10)
IV Thrombolytic	0 (0)	14 (100)	1 (10)	9 (90)
Antithrombotic on Day 2	12 (85)	3 (14)	10 (100)	0 (0)
Discharged on Antithrombotic	12 (85)	2 (14)	10 (100)	0 (0)
Discharged on HMG-CoA Reductase Inhibitors	9 (64)	5 (35)	5 (50)	5 (50)
Stroke Education	14 (100)	0 (0)	10 (100)	0 (0)
Assessment for Rehabilitation	4 (28)	10 (71)	6 (60)	4 (40)
Average LOS	6.2 days		4.3 days	

HMG-CoA Reductase Inhibitors in the pre-protocol group were 60% (*n*= 9) compared to 50% (*n*= 5) of patients in the post-protocol group. Stroke education in both groups was 100%. Finally, 26% (*n*=4) in the pre-protocol group were assessed for rehabilitation, whereas 60% (*n*=6) were assessed in the pre-protocol group.

Independent-samples *t* test were calculated to determine if the LOS in the pre-protocol group was significantly different from the LOS in the post-protocol group. No significant difference was found between the two groups ($t(22) = 1.009$, $p > .05$). The mean LOS in the pre-protocol group (*m* =6.6, *sd* =7.43) was not significantly different from the mean LOS in the post-protocol group (*m* =4.2, *sd = 1.9)* (Table 4.3).

Table 4.3 Independence Samples *t* test

LOS between the Pre-Protocol Group and Post-Protocol Group

LOS	N	MEAN (SD)	95% CI	T-TEST	DF	SIG (2-TAILED)
Group A	14	6.6 (7.4)	(-2.5, 7.1)	1.009	22	.432
Group B	10	4.2 (1.9)	(-1.9, 6.8)	1.175	15.374	.258

Group A= Pre-Protocol

Group B= Post-Protocol

CHAPTER 5

DISCUSSION

The discussion section explains the findings in relation to: (a) clinical practice, (b) theory, (c) research, (d) education, (e) evaluation of the theoretical framework, and (f) strengths as well as limitations of the EBP project and potential solutions. Discussion will help answer the PICO question: “In patients 18 years and older coming into the Emergency Room, what new interventions in stroke protocol compared to the current interventions will produce better outcomes?” In addition, the four outcomes were measured: (a) ensure that patients with a diagnosis of acute stroke are cared for through best practices, (b) decrease length of stay, (c) increase savings in hospitalization, and (d) comply with CMS and Illinois state guidelines. In addition, PSMH would be an accredited stroke certification center.

Explanation of Findings

One of the purposes of this EBP project was to facilitate the achievement of PSMH as a stroke center. In addition, PSMH initiated an evidence-based stroke protocol based on the Get with the Stroke Guidelines (GWTSG) according to the American Stroke Association. Accreditation as a Stroke Certification Center was granted to PSMH through Joint Commission (JC) on March 5, 2010. PSMH was awarded this national recognition for two years. Not only was stroke protocol incorporated, but also staff nurses were educated on the National Institute Stroke Scale (NIHSS). The NIHSS stroke scale was taught to all staff nurses in a face to face forum and computer based learning module. According to Gocan and Fisher (2008), “The National Institutes of Health Stroke Scale (NIHSS) is a standardized stroke scale that nurses can use to objectively and quantitatively to assess stroke survivors“(p. 34).

While there were no statistically significant differences between the pre-protocol group and the post-protocol group, there were some differences that should be noted. When compared with the pre-protocol group, the post-protocol group had a decrease in LOS by 1.9 days, which represented a cost savings. Patients admitted to PSMH with an acute stroke or TIA were either placed in an ICU or regular telemetry bed. The average cost of a patient while staying in an ICU bed is $4600/day whereas the cost of a regular telemetry bed is $1250/day. The cost savings in room charges for ICU was $8470 compared with a savings in telemetry room charge of $2375 based on an average LOS of 1.9 days. This decrease in LOS was not only a savings to the hospital, but to the patient as well. This decrease in LOS supported the findings of Brown and Yaste (1994). According to Brown and Yaste (1994), “instituting a stroke protocol showed modest savings in hospitalization cost for patients with acute stroke after the treatment of treatment protocol, which related to decrease in length of stay” (p.1961).

Secondly, there was a difference in antithrombotic therapy at discharge between the pre-protocol and the post-protocol groups. Even though this was not a statistically significant difference, this practice does decrease the risk of repeat strokes and institutes tertiary prevention in patients who have had a stroke. According to Stocke-Roberts et al (2006) instituting a QI intervention to improve hospital care provided to acute stroke and TIA patients can improve patient outcomes. This can be achieved by using a collaborative and systematic approach to QI that utilizes protocol utilization and ongoing data collection and review

Finally, stroke certification places PSMH in compliance with CMS and Illinois state guidelines. With compliance with CMS guidelines, PSMH is now able to care for Medicare and Medicaid patients that come into PSMH and receive reimbursement for their care. In addition, by adhering to state guidelines, EMS are now able to transport patients with stroke like symptoms to PSMH emergency room.

Implications for clinical practice

The implications for clinical practice instituting a stroke protocol are many. First, stroke protocol provides cost effective, quality care by incorporating evidence-based clinical guidelines. Second, PSMH adheres to CMS and Illinois state guidelines. Third, by decreasing LOS, this in turn decreases cost to both PSMH and the patient. Finally, it did answer the PICO question: “In patients 18 years and older coming into the emergency room, what new interventions in stroke protocol compared to the current interventions will produce better outcomes?”

Implications for the APN role

The roles of the APN in this evidence-based practice project (EBP) were many. First, as a change agent for PSMH in stroke certification, the APN educated the staff RNs on the use of the NIHSS stroke scale and Stroke Protocol. This allowed the APN to stay connected with the staff nurse in an important practice change, which is essential for effective leadership. As a change agent for PSMH, this demonstrates that the APN supports the organization and shares a common vision and direction for change.

Another role for the APN is consultant. As a consultant for stroke certification, the APN was able to make visible her knowledge, competency, and expertise. As a consultant for stroke care, the APN was able to collaborate with other facilities that are actively seeking stroke certification.

Another implication of the APN role is to ensure that PSMH will maintain stroke certification. Even though PSMH earned stroke certification through JC, maintaining that designation will be important. This can be done through daily chart audits on patients who come in the hospital with acute stroke or TIA symptoms. This will ensure that stroke protocol and the NIHSS stroke scale are followed.

Finally, another implication for the APN role is for continued research on the post-protocol group. Further data need to be collected to evaluate the implications of the stroke protocol and patient outcomes.

Applicability of the Theoretical Framework

The combination of Kurt Lewin's Three-Step Change Framework and the Iowa Model was applicable for this EBP project. The three-step change framework guided the interventions, while the Iowa Model guided the process of implementing the EBP project.

In the first stage of Kurt Lewin's Three-Step Change framework, unfreezing occurs when the person is becoming motivated to change (Lewin, 1951). Staff RNs became aware that they needed to be educated on the NIHSS stroke scale, and they had to be stroke certified as part of their job requirements. Education had to be in place prior to the incorporation of stroke protocol. To help motivate the nurses, they were made aware that they had to be stroke certified by November 2009 or they would be suspended without pay until they passed the certification. Nurses did receive their normal hourly pay for attending the education sessions.

In the second stage, moving involves putting new strategies, structures, or practices into place (Lewin, 1951). Nurses were assigned to attend a stroke certification class by their unit manager. Nurses had to attend the four hour class on the day that they were assigned. If the staff nurse did not attend the class as assigned, they were sent an electronic mail message from their manager reminding them of the next available date. After the four hour class, the nurses were able to print a copy of their certification from the American Stroke Association (ASA) website stating that they were stroke certified for a year. Also a copy was sent to their manager and placed in their education record.

The third and final step is refreezing. In this stage, integrating the newly adopted strategies, structures, and practices into existing operating procedures and work routines occur (Lewin, 1951). Once education was in place for the staff RNs and they were

stroke certified, stroke protocol could be incorporated. The stroke protocol required the NIHSS stroke scale be used as an assessment tool for the acute stroke or TIA patient (Appendix B).

The Iowa Model provided the structure for the project. The Iowa model is a framework to improve patient outcomes, enhance nursing practices, and monitor health care costs (Taylor-Piliae, 1999 p. 357). The Iowa model has four stages. In the first stage, either a problem or a knowledge-focused trigger has been identified. Last April, PSMH actively sought stroke certification to comply with CMS and Illinois state guidelines. This part of the model would be considered the problem section of the model.

Secondly, the model evaluates literature to see if there are sufficient studies to proceed with the project or conduct research for the project. An extensive review of literature was conducted by this writer. There was sufficient literature to support the need to institute stroke protocol at PSMH (Ross et al. (2007), Sattin et al. (2006), Schwamm et al. (2005).

The third step in the model evaluates if the change is appropriate for adoption into practice and if it is, then change will occur. If it is not appropriate, then change will not occur. By obtaining stroke certification, PSMH was recognized as a stroke center that patients with acute stroke or TIA symptoms can go to for treatment. Through this recognition, PSMH implemented evidence-based protocols through best practices. In addition, emergency medical services (EMS) are now able to transport patients to PSMH.

The fourth and final step in the model evaluates outcomes through patient satisfaction, staff satisfaction, and decrease hospital costs. Though staff were reluctant at first to obtain stroke certification, they were pleased with the outcome of becoming a stroke certification center for themselves and PSMH. Patients that were diagnosed with

acute stroke or TIA were mailed satisfaction surveys to their home after discharge. Results showed that patients were satisfied with the stroke care they received at PSMH.

Finally, the cost savings to PSMH and to the patient ranged from $8479 to $2375 in room charges for a patient in an ICU or a regular telemetry room respectively.

Strengths and Limitations

The strengths of this project are many. First, there was a cost savings for both the patient and PSMH after stroke protocol was incorporated. The savings were for only one patient; if the hospital were to look at the total amount of patients in a year with a stroke the savings to PSMH would be from $821, 590 to $230,375 per year. This supports the evidence adhering to a protocol is cost-savings to both the patient and the facility. Second, the use of antithrombotic therapy in tertiary prevention of stroke was increased in the post-protocol group. Prior to the implementation to the protocol, only 80% were discharged on antithrombotic, increasing the risk in the patients who did not receive the treatment. With the incorporation of the protocol, patients were now discharged on antithrombotic therapy, hence decreasing their risk of a secondary stroke.

The biggest limitation of this EBP project was the sample size. Twenty-four patients is not a sufficient sample to make any generalizations. Future research is needed to obtain an accurate picture of the patient population. Another limitation was time. This writer was only able to obtain four months worth of data from the agency. To acquire accurate information on the post-protocol statistics, data should be collected over a longer period of time. This is a recommendation for the APN practice.

Implications for the Future

Implications for the future in: (a) research, (b) theory, (c) practice, and (d) education are listed below. Implications for the future in research will focus on continuing to evaluate stroke protocol and patient outcomes. The APN in the DNP role should continue to monitor, not only the use of the stroke protocol and the nurse instituting the

NIHSS stroke scale, but also the maintenance of certification through JC. Implications for the future in theory are important to the APN. The Iowa Model and Kurt Lewin's Three-Step Change framework were a perfect fit for this project. The APN can be a leader in the use of these theories, not only in this project, but for future certifications for PSMH. The role of the APN in his or her practice as a DNP is very important. The APN can strengthen his or her practice by concentrating on research utilization in direct care, improvement in delivery of care, patient outcomes, and clinical systems management. Finally, maintaining stroke protocol will be a continuous process. Completing monthly chart audits on patients who come in with an acute stroke or TIA should be completed by the DNP. Through this process, the DNP will use the quality improvement process that PSMH utilizes: Plan, Do, Study, and Act (PDSA) to increase compliance amongst the RNs and the MDs.

Conclusion

The results of this project, though not statistically significant, show significance in both financial and secondary prevention of stroke. Further follow up with data collection, needs to be completed to evaluate the implications of stroke protocol and patient outcomes. Stroke is the third leading cause of death right behind various cancers; through incorporating stroke protocol at PSMH, hopefully this will decrease the risk of a secondary infarct and continue to improve patient outcomes.

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BIOGRAPHICAL MATERIAL

Ms. Nielsen graduated from Indiana Wesleyan University with a bachelor's degree in the science of nursing in 1995. She worked in various settings before completing her MSN from Valparaiso University in 2006. Ms. Nielsen received her family nurse practitioner (FNP) certificate from Valparaiso University in 2007. She has been practicing as an FNP in the trauma center for the past two years where she had worked as a consultant for stroke certification at PSMH. She also teaches nursing to undergraduate students as an Assistant Professor at Olivet Nazarene University. Ms. Nielsen is attending Valparaiso University and will graduate with her DNP in 2010. Ms. Nielsen is certified as an FNP through AANC; she is a member of Sigma Theta Tau International Kappa Sigma Chapter, and American Academy of Nurse Practitioners.

APPENDIX A

Acute Stroke Flow sheet- National Institute of Health Stroke Scale (NIHSS)

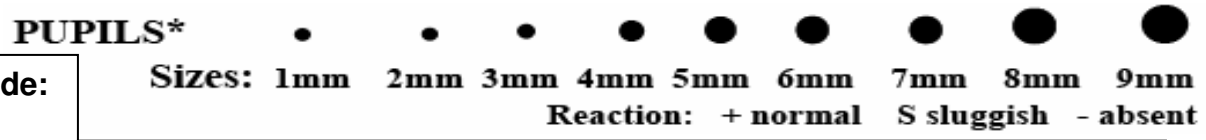
ED/Admit Day ICU for TPA- VS and NIHSS q15 min for first 2 hours, q 30 min. for next 6 hours, q1 hr until 24 hours (Full NIHSS upon admit, q 4 hrs. Modified NIHSS all other assessment intervals)
ED/Admit Day ICU for Acute Ischemic Stroke/ Transient Ischemic Attack- VS and NIHSS q 15 min for first 2 hrs or determined stable by Physician, then q1 hr for 24 hours (Full NIHSS upon admit and beginning of shift, modified NIHSS all other assessment intervals)
ICU after first 24 hours of acute event- VS q2 hours, Full NIHSS on first assessment of shift, modified NIHSS q 2 hours
3W- VS q4 hr, Full NIHSS on first assessment of shift, modified NIHSS q 4 hours
ED/Admit Day ICU for Hemorrhagic Stroke- NIHSS on admission to unit, as well as at 24 hours, discharge/transfer or change in condition.
Vital Signs with Temperature and neuro checks q 15 min X 2 hrs then every 2 hrs and PRN.
Neurological Deterioration: All units Full NIHSS initially and then modified q 15 min for first 2 hrs immediately following any neurological status deterioration.
*Shaded area interval NIHSS

Date: **Score Time**

Category	Description						
1a. **Level of Consciousness (LOC)** ***score of 2 or 3 consider Glasgow Coma Scale	Alert, keenly responsive Not alert (arousable by minor stimulation) Not alert (responds to repeated or painful stimuli) Only reflex motor, autonomic effects, or totally unresponsive	0 1 2 3					
1b. **LOC- Questions** (month, age)	Answers both questions correctly Answers one question correctly Answers neither question correctly	0 1 2					
1c. **LOC- Commands** (Open/ close eyes, make fist, release fist) pantomime may be used	Performs both tasks correctly Performs one task correctly Performs neither task correctly	0 1 2					
2. **Best Gaze** (Patient follows examiners finger or face through full horizontal field)	Normal Partial gaze palsy Forced Deviation (deviation not overcome by oculocephalic maneuver)	0 1 2					
3. **Visual** (Introduce visual stimulus/threat to patient's visual field quadrants	No visual loss Partial hemianopia (sec tor or quadrant field deficit) Complete hemianopia (dense field loss, loss of half a visual field) Bilateral hemianopia (Blind)	0 1 2 3					
4**. Facial Palsy** (Show teeth, raise eyebrows, squeeze eyes shut) pantomime may be used	Normal Minor Paralysis (mild asymmetry on smiling) Partial Paralysis (paralysis of lower face) Complete (one or both sides; upper and lower face)	0 1 2 3					
5a. **Motor Arm- Left** (Test each limb independently: Palm down- Elevate arm to 90˚if sitting, 45˚ if supine. Score drift movement over 10 seconds)	No drift (limb holds full 10 seconds) Drift (drifts down but does not fall to rest on a support) Some effort against gravity (drifts and falls to support) No effort against gravity (trace movement, limb falls immediately) No voluntary movement	0 1 2 3 4 UN					

	Amputation, joint fusion, etc.						
5b**. Motor Arm- Right** (As above)	No drift (limb holds full 10 seconds) Drift (drifts down but does not fall to rest on a support) Some effort against gravity (drifts and falls to support) No effort against gravity (trace movement, limb falls immediately) No voluntary movement Amputation, joint fusion, etc.	0 1 2 3 4 UN					
6a. **Motor Leg- Left** (Test each limb independently: With patient supine, elevate leg to 30° and score drift/ movement over 5 seconds)	No drift (limb holds full 5 seconds) Drift (drifts down but does not fall to rest on a support) Some effort against gravity (drifts and falls to support) No effort against gravity (trace movement, limb falls immediately) No voluntary movement Amputation, joint fusion, etc.	0 1 2 3 4 UN					
6b. **Motor Leg- Right** (As above)	No drift (limb holds full 5 seconds) Drift (drifts down but does not fall to rest on a support) Some effort against gravity (drifts and falls to support) No effort against gravity (trace movement, limb falls immediately) No voluntary movement Amputation, joint fusion, etc.	0 1 2 3 4 UN					
7. **Limb Ataxia** (finger-nose, heel down shin)	Absent Present in one limb Present in two limbs	0 1 2					
8. **Sensory** (Pin prick to face, arm, trunk, and leg. Compare side to side. Look at grimace in aphasic patient)	Normal Mild to moderate sensory loss (less sharp/ dullness) Severe to total sensory loss (not aware of touch)	0 1 2					
9. **Best Language** (Name item, describe a picture, read a sentence)	No aphasia Mild to Moderate aphasia (reduced fluency or comprehension) Severe aphasia (communication exchange very limited) Mute, global aphasia	0 1 2 3					
10**. Dysarthria** (Evaluate speech clarity by having patient read or repeat listed words)	Normal articulation Mild to moderate dysarthria (can be understood) Severe dysarthria (unintelligible or worse) Intubated or other physical barrier	0 1 2 UN					
11. **Extinction and Inattention** (Use information from prior testing to identify neglect or double simultaneous stimuli testing)	No abnormality (no neglect) Visual, tactile, auditory, spatial, or personal inattention, or extinction to bilateral stimulation in one of the sensory modalities Profound: more than one modality affected	0 1 2					
Full NIHSS Score:							

NIHSS Score Guide:
0-7 Mild
8-15 Moderate
16-26 Severe



Patient Education provided: ❑ CT of brain _____ ❑ Labs _____ ❑ Vital Signs _____❑ Swallow Screen ❑ IV t-PA ❑
Plan of Care for Stroke

Pupils	**Time:**					
Right	Size					
Right	Reaction					
Left	Size					
Left	Reaction					

Vital signs

Temperature					
Pulse					
Respirations					
Pulse Ox					
Blood Pressure					
Blood Sugar					
Nurse Initials:					

Nurse Signature/ Initials		Nurse Signature/Initials	

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APPENDIX B

Orders for Initial Management of Patients with Suspected Acute Stroke

Checked boxes (☑) are automatic orders.

☑ Time last known asymptomatic: _____; if less than 3 hours call "TEAM - S"
☑ STAT non-contrast head CT scan.
☑ Neurology consultation (STAT if symptoms occurred within the 3-hour window)
☑ Initial NIH Stroke Score: _____
☑ Start continuous cardiac rhythm and oxygen saturation monitoring.
☑ Set automated BP for 15 minute intervals. Set BP alarms for 180/110. Vital Signs every 15 minutes.
☑ Oxygen at 2 LPM via nasal cannula for target oxygen saturation greater than 95%
☑ IV access x 2; NS at 75ml/hr; saline lock in opposite arm.
☑ Patient is to be NPO (including fluids and medications)
☑ Obtain temperature and bedside glucose
☑ Stat EKG, Obtain weight (_____ kg ☐ Measured or ☐ Estimated)
☑ Neuro checks every 15 minutes using NIHSS. . (if not t-PA candidate may go to every one hour while in ED if stable)
☑ STAT blood draw for: CBC; aPTT, INR; BMP; CK-MB; Troponin-I; Type and screen; serum pregnancy (if applicable)
☑ Avoid arterial sticks (if possible)
☑ Do not give aspirin, heparin or warfarin.
☑ Notify attending physician immediately for any change in neurological condition.
☐ For BP greater than 180/110, start labetolol 10 mg bolus IV over 1 to 2 minutes. Dose may be repeated every 10 to 20
minutes PRN (MAX dose 150 mg). Alternatively, following the first bolus, an IV infusion can be instituted. Hold medicine
if heart rate is less than 55.

☐ **Other:**
_____
_____

Answers to ALL of the following statements must be "NO" to be eligible for tPA therapy for stroke.

Yes	No	Medical History Exclusions
		Symptoms started over 3 hours prior; or duration of symptoms unclear (awoke with stroke deficit)
		Current use of oral anticoagulants (e.g. warfarin) or an INR greater than or equal to 1.7*
		Use of heparin in the previous 48 hours AND a prolonged partial thromboplastin time
		History of stroke (any type),head injury or acute MI in previous 3 months
		History of gastrointestinal or urinary bleeding within the preceding 21 days
		History of major surgery, or biopsy of a parenchymal organ within the preceding 21 days
		History of recent (within 7 days) arterial puncture at a non-compressible site
		History of prior intracranial hemorrhage, neoplasm, arteriovenous malformation or aneurysm
		History of seizure at the time of stroke onset
		Patient is pregnant (Uncomplicated pregnancy is not an absolute contraindication. Risks and benefits to be discussed)
		History of recent (within 7 days) lumbar puncture
		Clinical Examination Exclusions
		Spontaneous clearing of neurologic signs
		Evidence of active bleeding or acute trauma (fracture) on examination
		Neurological deficits are mild and/or isolated (e.g., ataxia alone, sensory loss alone, dysarthria alone, or minimal weakness, such as NIHSS less than 4 AND normal language AND visual fields)
		Clinical presentation that suggests subarachnoid hemorrhage even if the initial CT scan is normal
		Blood pressure remaining greater than 180/110 despite treatment
		Suspicious septic embolus as etiology of stroke (suspicion raised with any stroke with a fever)

		Laboratory Exclusions
		Glucose less than 50 g/dl or greater than 400 mg/dl
		Platelet count less than 100,000/mm^3
		INR equal to or greater than 1.7
		Head CT Exclusions
		High-density lesions consistent with hemorrhage or possible hemorrhage on CT
		CT with multilobar infarction (hypodensity greater than 1/3 cerebral hemisphere)

* Use clinical judgment regarding compliance, dose, and timing of warfarin therapy. If there is no clinical suspicion of abnormal coagulation laboratories, IV t-PA may be initiated before the availability of coagulation study results but should be discontinued if INR greater than or equal to 1.6 or the PT/aPTT is elevated by local laboratory standards.

CAUTIONS:

1. Caution is advised giving intravenous tPA (Activase/Alteplase) to persons with severe stroke (NIHSS greater than 22).
2. Early changes on CT of a recent major infarction, such as obvious hypodensity, edema or mass effect, may increase risk of ICH.

Acute Ischemic Stroke/TIA/ Stroke Like Symptoms and Rule Out Stroke Order Set (Non-tPA patients)

- **This order set should be used only after the "Initial Management of Patients with Suspected Acute Stroke" orders are implemented.**
- **Checked boxes (☑) are automatic orders.**

Allergies:_____

ADMIT: ☐ MICU ☐ SICU ☐ Telemetry (3 West)

DIAGNOSIS: ☐ STROKE ☐ TIA

Last time known asymptomatic: Date_____ Time_____ NIHSS Score: _____

t-PA not given due to (response absolutely necessary): _____

Admitting Physician: _____Attending Physician:_____

Neurology Consult: _____ Cardiology Consult: _____

☑ **Vital Signs including temperature and NIHSS:**

- **Critical Care Admission:**
  - On admission
  - Every hour for the first 24 hours
  - After first 24 hours every 2 hours
  - With any neurological change (every 15 minutes X 2 hours)
  - Upon discharge
  - Call Physician STAT for change in mental status, Pulse over 120 or under 50, Respirations over 24 or less than 8

- **Telemetry (3 West) Admission:**
  - On admission
  - Every 4 hours
  - With any neurological change (every 15 minutes X 2 hours)
  - Upon discharge
  - Call Physician STAT for change in mental status, Pulse over 120 or under 50, Respirations over 24

☑ Continuous pulse oximetry
☑ Cardiac monitoring for 72 hours then discontinue if no significant rhythm abnormalities
☑ Weight on admission _____ ☐ Weigh daily
☑ I & O and monitor for continence of bowel and bladder
☑ If unable to void after 4 hours, do bladder scan and if the residual is more than 300 mL, insert Foley catheter
☑ NPO until swallowing screen by nurse.

- If "problem" identified, continue NPO status and order Speech Pathology Consult.
- If "no problem" identified, order diet: _____ and implement aspiration precautions

☑ Provide patient and/or family with the Stroke Education Packet
☑ Assess fall risk and implement fall precautions
☑ Bed rest
☑ Turn every 2 hours if unable to turn themselves
☑ No lifting or pulling of shoulder on affected side

☑ Contact primary care physician or neurologist for completion of the remaining of this order set upon patient's arrival to floor.

Activase/Alteplase (t-PA) Administration and Post-treatment Orders for Acute Stroke

- **This order set should be used only after the "Initial Management of Patients with Suspected Acute Stroke" orders are implemented.**
- **Checked boxes (☑) are automatic orders.**

Allergies: _____**Patient Weight**:_____ Kg

TIME OUT: Pre Activase/Alteplase (t-PA) administration

☐ Patient last known normal within three (3) hour window.
☐ Patient does not meet any exclusionary criteria as referenced in the "Orders for Initial Management of Patients with Suspected Acute Stroke" order set, signed by both RN and Physician.
☐ Patient's systolic blood pressure is less than 185 mmHg and diastolic blood pressure in less than 110 mmHg.
☐ Patient has an NIHSS less than 22 (Use with extreme caution in patients with NIHSS greater than 22).
☐ Patient and or legal representative have been given the Activase/Alteplase (t-PA) fact sheet.
☐ Consent has been obtained for the administration of Activase/Alteplase (t-PA) from the patient or legal representative.

Nurse's Signature: _____ Date: _____Time: _____
Physician Signature: _____ Date: _____ Time: _____

NOTE: Do not substitute any other thrombolytics for Activase®/Alteplase and do not use cardiac dosing when administering Activase®/Alteplase for stroke indication.

Activase/Alteplase (t-PA) Dosing:

Total Dose = 0.9 mg x weight in kg = _____mg **(Maximum Dose 90 mg)**.

☐ Give _____ mg (10% of total dose) Activase as bolus IV push over one minute

THEN,

☐ Give the remainder _____ mg (90% of total dose) Activase via IV infusion over one hour

Reconstitution and administration instructions for Activase/Alteplase tPA

☐ Reconstitute the vial(s) of Activase using supplied preservative (free water). Direct the stream of water into the lyophilized cake. Swirl but DO NOT SHAKE. Slight foaming is not unusual. Let stand several minutes to allow dissipation of large bubbles. Concentration is now 1 mg/mL. You may need to use more than one vial for the total dose.
☐ Locate an empty sterile 100-mL bag (or empty a 100-mL bag of saline fully). This bag will be used for infusion of the reconstituted t-PA. Label the bag "t-PA infusion dose" with the patient's name, birth date, strength and amount.
☐ Withdraw the total dose (including bolus dose and infusion dose) directly from the Activase bottle(s) and inject into the 100-mL bag.
☐ Withdraw the bolus dose (10%) from the bag into a syringe. Label this syringe "t-PA Bolus" and include patient's name, birth date, strength and amount. Set aside.
☐ The 100-mL bag now contains the t-PA "infusion" dose. Connect the bag to the infusion tubing. Prime the tubing carefully to avoid discarding the tPA, and place in the infusion pump.
☐ Save any remaining t-PA in the bottle to verify dosing with treating physician.

- ☐ Verify drug (Activase/Alteplase) and dosing with treating physician.
- ☐ Bolus dose is given IV push over 1 to 2 minute(s).
- ☐ Infusion dose is given over 1 hour. Set the infusion rate on the pump to be delivered over one (1) hour.
- ☐ At the end of infusion, inject 20 mL of normal saline into the bag and purge the pump to empty the line completely of t-PA.

APPENDIX C

Stroke Rounds
Date _____ Time CT read_____
First time seen at triage _____ tPA given Yes No
Time patient last know normal _____ Time tPA given _____
Time first seen by physician _____ Patient made NPO _____
Time CT done _____

Order Set Used			**Where initiated**
Initial Order Set	Y	N	__ ED ____Floor
AIS/TIA Order Set	Y	N	__ ED ____Floor
t-PA Order Set	Y	N	__ ED ____Floor

ED Diagnosis _____

DVT Prophylaxis	Y	N	Transcranial Doppler	Y	N
VS & NIHSS per order set	Y	N	Bedside SST used	Y	N
Activity per order set	Y	N	SLP	Y	N
MRI:	Y	N	PT/OT	Y	N
MRA:	Y	N	Rehab evaluation	Y	N
CTA:	Y	N	Echocardiogram	Y	N
Carotid US:	Y	N	Statin on DC	Y	N

History and Risk Factors

Family Hx	Carotid Artery	Asthma
TIA	Sickle Cell	COPD
AIS	HTN	Renal
ICH	Diabetic	Smoker
AMI	Hypothyroid	OSA
CAD	Cholesterol	Alcohol
A-Fib	Obesity	Recreational Drugs

Consults:
Neurology: _____ Cardiology _____
Neurosurgery: _____ Other: _____
Notes: _____
_____
_____
_____
_____
_____
Discharge Diagnosis TIA AIS ICH

Disposition Home Transfer Rehab SNF Died

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