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Transient Ischemic Attack (tia) Guideline Knowledge And Perceived Barriers To Implementation Amongst Emergency Department Health Care Providers In A Rural State

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TRANSIENT ISCHEMIC ATTACK (TIA) GUIDELINE KNOWLEDGE AND PERCEIVED BARRIERS TO IMPLEMENTATION AMONGST EMERGENCY DEPARTMENT HEALTH CARE PROVIDERS IN A RURAL STATE

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ABSTRACT

Transient Ischemic Attack (TIA) is a prominent risk factor for subsequent stroke, and its associated morbidity, mortality, and health care costs. Studies have demonstrated up to 80% reductions in subsequent stroke rate with prompt, optimized protocols for rapid TIA evaluation and treatment. National Stroke Association (NSA) and American Heart Association (AHA) guidelines have recommended institution of protocols assuring timely completion of the recommended testing, and evaluation by a stroke expert within 48 hours. However, limited literature exists on the implementation of guideline-based care in rural regions, and the few studies related to TIA suggest that barriers including difficulty accessing services and poorly updated TIA knowledge amongst rural, non-neurologist providers exist despite national guidelines.

Behavior change theories have suggested that evaluating factors hindering or motivating behavior change may aid in tailoring implementation of guideline-based practices. This descriptive study sought to understand ED health care providers' perceived barriers to implementation of NSA/AHA TIA guidelines in a rural state. All healthcare providers in each of the state's emergency departments were invited by email to complete an online anonymous survey assessing knowledge of present TIA guidelines and perceived barriers to implementation of these guidelines in their practice setting using a modified Barriers and Facilitators Assessment Instrument (BFAI). After completing the knowledge based questions, respondents were presented a brief educational overview of the guidelines to ensure adequate familiarity with the TIA guidelines to complete the BFAI.

Thirty-nine respondents completed the survey. Twenty-seven worked at regional or academic medical centers, and 12 worked at critical access hospitals representing the more rural regions of the state. Consistent with prior work, the most notable finding of this study was a low awareness of the present TIA guidelines amongst ED providers, with none of the survey respondents correctly identifying all items consistent with the evaluation guidelines for TIA. In addition to a low awareness of the guidelines, a number of perceived barriers to implementation were identified, which may inform efforts at implementation, and/or offer a model for similar barrier assessment elsewhere.

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CHAPTER 1: INTRODUCTION

1.1. Introduction

Stroke is a common and often deadly disease affecting approximately 795,000 people in the United States (U.S.) each year and costing an estimated $38.6 billion annually (Heidenreich et al., 2011; Roger et al., 2012). Nationally, there were 128,842 deaths from stroke in 2009 with minorities disproportionately affected by the disease (Kochanek, Xu, Murphy, Minano, & Kung, 2011; Rogers et al., 2011; Centers for Disease Control (CDC), 2012). While these numbers are daunting, many of the risk factors for stroke are medically and/or behaviorally modifiable, including hypertension, dyslipidemia, tobacco use, diabetes, obesity, diet, physical inactivity, and excessive alcohol use (Corella et al., 2013; Curb et al., 2004; Larsson, Akesson, & Wolk, 2014; Salaycik et al., 2007; Sarnowski et al.., 2013; Vermeer et al., 2006).

Transient ischemic attacks (TIAs) have been defined as "brief episodes of neurologic dysfunction resulting from focal cerebral ischemia not associated with permanent cerebral infarction" (Easton et al., 2009, p. 2276). TIAs are, however, associated with elevated risk of subsequent stroke. Johnston, Gress, Browner, & Sidney (2000) found that 10.5% of patients with a TIA experienced a stroke within the next 90 days, with half of these occurring within 48 hours. Given the high risk of subsequent stroke, TIAs present an opportunity for secondary prevention through immediate medical intervention and/or behavior change strategies to reduce risk. Research has demonstrated up to 80% reduction in subsequent stroke rate with prompt, optimized protocols for rapid TIA evaluation and treatment (Rothwell et al., 2007). National Stroke Association (NSA) and

American Heart Association (AHA) guidelines have recommended institution of protocols assuring timely completion of the recommended evaluation (labs, EKG, brain and vascular scans, etc.), and evaluation by a stroke expert within 48 hours (Easton et al., 2009; Johnston et al., 2006; Johnston et al., 2011). However, despite the available research and guidelines, interventions to reduce stroke risk especially in the acute period following a TIA have been underutilized (Johnston et al., 2011) and some patients may not receive thorough risk factor evaluations and counseling (Johnston et al., 2006).

Further, rural populations may be particularly vulnerable to stroke, while also having lesser access to care (Pearson & Lewis, 1998; Joubert et al., 2008), and limited literature exists on the implementation of guideline-based care in rural regions (Parsons, Merlin, Taylor, Wilkinson, & Hiller, 2003). The few previous studies related to TIA/stroke guideline implementation in rural regions suggest barriers including difficulty accessing services (Warner et al., 2010) and poorly updated TIA knowledge amongst rural, non-neurologist providers exist despite the availability of national guidelines (Massengo et al., 2013). Research on practice behavior change is limited, but the available literature suggests that evaluating factors hindering or motivating behavior change may aid in tailoring implementation of guideline-based practices (Grol, 1992; Grol & Grimshaw, 2003; Grol & Wensing, 2004; Kanouse, Kallich, & Kahan, 1995; Robertson, Baker, & Hearnshaw, 1996).

1.2. Study Purpose

This descriptive survey study seeks to understand emergency department (ED) health care providers' knowledge of NSA and AHA TIA guidelines, and perceived barriers to their implementation in a rural state. It is hoped that this descriptive data may serve as a basis for generation of hypotheses for further study on this topic. Additionally, at the time of this study, the state involved was preparing to implement a statewide rapid TIA evaluation and management program, and it is hope that providing insight into health care providers' perceived barriers may assist in tailoring protocols for improved implementation of these guidelines in the involved state, as well as more broadly.

1.3. Theoretical Framework

Pender's Health Promotion Model (HPM) is a nursing theory that suggests that a variety of background factors including individual characteristics, experiences, beliefs, and interpersonal and or situational influences influence patients' engagement in health promoting behaviors (Pender et al.., 2011). TIA, as a significant risk factor for subsequent stroke, but one without lasting effect on one's cognitive or physical abilities, may represent an experience that influences one's interest in health promoting behaviors. Further, as the HPM suggests that interpersonal influences—including health care providers—and situational influences—including availability and accessibility of care—may influence a patient's efforts at health promoting behaviors (2011). Efforts to streamline TIA evaluations and risk factor counseling seek to minimize barriers to accessing care at a time when patients may be motivated for change.

While Pender's HPM offers a framework in which TIA may represent an influential factor in one's motivation for health promoting behaviors, and also suggests the importance of minimizing barriers to patients seeking preventive health care, the Promoting Action on Research Implementation in Health Services (PARIHS) framework offers a proposed model for understanding and successfully implementing evidence-based practice (Rycroft-Malone, 2004). The PARIHS framework presents the three dynamically interacting factors influencing research implementation as the evidence, the context, and the facilitation of implementation (2004). Further, it suggests that implementation is most successful when the evidence is robust, the context is receptive to change with strong leadership and appropriate monitoring, and when appropriate facilitation exists, with influence from external and internal facilitators (2004). The factors considered on the PARIHS framework have each undergone a content analysis and a study evaluating its content validity. While the study supported evidence, context, and facilitation as three key factors in implementation of evidence-based practice, to date, the model has limited construct validity (Rycroft-Malone, et al., 2004), and further empirical study including prospective use of the model in implementation projects has been suggested (Helfrich et al., 2010). In the context of this study, with robust evidence and guidelines supporting the rapid evaluation and risk factors management with TIA, the PARIHS model theoretically supports the investigation of barriers and facilitators as pieces of the context that may subsequently inform effective facilitation.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Transient ischemic attack presents an opportunity for health promotion, and rapid TIA evaluation and risk factor management is supported by the literature (Banerjee et al., 2009; Horer, Schulte-Altedorneburg, & Haberl, 2011; Ross et al., 2007; Rothwell et al., 2007; Wu et al., 2009) and the current NSA and AHA TIA guidelines (Easton et al., 2009; Johnston et al., 2006; Johnston et al., 2011). However, despite this, variable utilization and implementation practices exist (Johnston et al., 2006; Johnston et al., 2011), and rural populations may be more vulnerable to stroke while also having greater barriers to accessing care (Pearson & Lewis, 1998; Joubert et al., 2008). Further, while the literature and guidelines support rapid TIA evaluation and management, understanding of guideline implementation in rural regions is limited (Parsons, Merlin, Taylor, Wilkinson, & Hiller, 2003). This section will review, in turn, literature on the topics of rapid TIA evaluation and management, the NSA & AHA TIA guidelines, implementation of guidelines in rural regions, and the role of assessing barriers in the implementation of guideline-based practices.

2.2. Rapid TIA Evaluation and Treatment

Multiple studies have evaluated the effects of rapid TIA evaluation and treatment on risk for subsequent stroke with positive findings. Rothwell et al. (2007), within a prospective population-based study, evaluated the rates of subsequent stroke in non-hospitalized TIA or minor stroke patients before (phase one) and after (phase two) initiation of a rapid TIA evaluation protocol. The study was conducted in Britain, and accrued 310 TIA/minor

stroke patients during phase one and 281 patients during phase two. During the first phase patients suspected of having a TIA or minor stroke, but not needing hospitalization were referred by their primary care provider for evaluation that was appointment based (rather than immediate), and treatment recommendations were not initiated by the TIA clinic, but rather faxed to the patients primary care provider, usually within 24 hours, who could then initiate the recommended standard treatments (2007). Examples of standard risk factor-based treatments based treatments included aspirin, clopidogrel, simvastatin, anti-hypertensives, and anticoagulants (2007).

During phase two, rather than requiring appointments, the TIA clinic adopted a protocol in which primary care providers could send patients to the TIA clinic during the afternoon of the day the patient sought care from their PCP. Additionally, during phase two providers at the TIA clinic would initiate appropriate treatments at the time of their evaluation, rather than recommending the primary care provider make the changes (2007). With the change in protocol, the median delay from time of TIA to initiation of prescription treatment fell from three days in phase one to less than one in phase two, and the 90 day rate of recurrent stroke fell by 80% from 10.3% (32/310 patients) in phase one to 2.1% (6/281 patients) in phase two (adjusted hazard ratio 0.20, 95% CI 0.08–0.49; p=0·0001), independent of age and sex (2007). They did not find any increased risk of intracerebral hemorrhage or other bleeding with the more rapid initiation of treatment in phase two (2007). While the study was not randomized, the data during both phases was prospectively collected, and all patients within the study population presenting for care were included, minimizing the potential for bias (2007).

Wu et al. (2009) conducted a similar study in Canada comparing the 90 day risk of subsequent stroke in patients receiving rapid evaluation for high-risk TIA versus a historical cohort of high risk TIA patients receiving standard care. In this study, however, the rapid evaluation was conducted on an inpatient basis in a 'rapid evaluation unit' (2009). Similarly to Rothwell et al., Wu et al. found a significantly reduced risk of stroke in patients receiving the rapid TIA evaluation (2009). The 90-day risk of stroke in the standard care cohort was 9.7%, versus 4.7% in the rapid evaluation cohort (2009). However, they also found that average cost of care during the first year was higher in the rapid evaluation cohort ($8360 versus $4820 (Canadian)), which they attribute to the higher initial inpatient costs (2009). Limitations of this study include the potential for confounding due to its non-randomized nature and use of a historical cohort (2009).

Ross et al. (2007) investigated an accelerated ER diagnostic protocol for TIA evaluation versus traditional management through hospital admission at a suburban, academic medical center in the U.S. In their prospective study 75 patients presenting to the ER and diagnosed with TIAs were randomized to the accelerated diagnostic protocol, and 74 to traditional hospital admission (2007). The initial pre-randomization work-up included a medical history and physical exam by an ER physician, ECG, cardiac monitoring, head CT, complete blood count with differential, serum glucose, electrolytes, blood urea nitrogen, and creatinine. Patients also received appropriate antiplatelet therapy (2007). Patients identified as having existing conditions that would prohibit reliable ER evaluation and necessitate admission were not included in the study (2007). Patients who

were enrolled received the same testing components, but in the ER or hospital respectively (2007). The testing included continued cardiac monitoring, carotid Doppler, echocardiography, and serial nursing "neurochecks", and consultation with a neurologist (2007). Patients enrolled on the accelerated diagnostic protocol arm were admitted based on predetermined criteria if: they developed recurrent neurological symptoms or stroke; imaging revealed significant carotid stenosis requiring urgent revascularization; evidence of a thromboembolic source requiring inpatient heparin anticoagulation was found; evaluation was unable to be safely completed with discharge home within 18 to 24 hours; or the physician thought that admission became otherwise necessary (2007).

Analysis of the two study groups showed that they were similar in age, stroke risk factors, and gender percentages (2007). The ER accelerated diagnostic protocol group was found to have a shorter median length of stay (25.6 [interquartile range 21.9 to 28.7] vs. 61.2 [interquartile range 41.6 to 92.2] hours), lower 90 day costs ($890 [interquartile range $768 to $1,510] versus $1,547 [interquartile range $1,091 to $2,473]), a shorter median time to carotid imaging completion (13.0 vs. 25.2 hours), and higher percentage of patients receiving this imaging (97% vs. 91%) (2007). The percentage of patients receiving echocardiography was also higher in the accelerated diagnostic protocol group (97% vs. 93%), with a shorter median time to completion (19.1 vs. 43.0 hours) (2007). The rates of recurrent stroke and major clinical event were similar in the two groups with 3 strokes in the accelerated diagnostic protocol group, two strokes in the hospitalized group, and four major clinical events in each group (2007). The study was limited in that it was not powered to show differences in clinical outcomes. It does, however,

demonstrate a reduction in time and cost with the accelerated diagnostic protocol, with outcomes that appear similar without any obvious discrepancy (2007).

Nurse-led TIA evaluation clinics have also been studied in Britain. Banerjee et al. (2009) studied the implementation of a nurse led TIA clinic for initiation of secondary prevention measures. In the study, general practitioners were provided a screening protocol for anterior circulation TIAs with patients meeting criteria being referred to the nurse-run clinic (2009). The evaluation included history taking, lab tests, EKG, carotid duplex, chest radiograph, and when possible same day transthoracic echocardiogram (2009). Based on the assessment the nurse would initiate aspirin 300 mg and discuss risk factor and lifestyle recommendations (2009). A neurologist would then see the patients the following week (2009). Patients found to have 70-99% carotid stenosis were immediately admitted for vascular surgery evaluation and patients with a TIA the day of the nurse evaluation, or a history of recurrent TIAs were also admitted for evaluation (2009). In the study the median time from referral to nurse evaluation was three days, and the diagnostic rate of vascular events in the study was 86% as compared to the national average of 55% (2009).

Horer, Schulte-Altedorneburg, and Haberl (2011) studied the safety of rapid outpatient TIA management for diagnosis and risk stratification. In the study, several criteria for high early stroke risk were established including $ABCD^2$ score of four or greater and TIA within the past 72 hours, newly detected atrial fibrillation, symptomatic carotid stenosis, and recurrent TIA, and such patients were admitted to the stroke unit (2011). Patients not

meeting criteria necessitating admission were immediately started on standard secondary prevention measures, and were followed by telephone at 90 days (2011). Of the 123 patients seen in the rapid evaluation clinic, 56% were diagnosed with TIA, and 44% with TIA mimics (2011). The median time from symptom onset to evaluation in clinic was 48 hours (2011). Compared to the projected 90-day stroke rate of 5.7% based on the cohorts $ABCD^2$ scores, two patients (1.6% of all enrolled; 2.9% of those diagnosed with initial TIA or minor stroke) experienced stroke, suggesting that outpatient evaluation and initial risk stratification of patients with suspected TIA is safe (2011). The study does have limitations however in its moderately-sized cohort and use of a projected stroke risk data, rather than a true, contemporaneous control.

Lastly, Lavallee et al. conducted a study in Paris, France following patients admitted to newly-formed 24-hour hospital-based TIA clinic (2007). Patients were admitted for cerebral or retinal symptoms that fully resolved and were suspected to be ischemic in nature (2007). The program was advertised to family doctors, cardiologists, neurologists and ophthalmologists in the region, who referred patients to the clinic (2007). Suspected TIA patients received an evaluation including vascular neurologist evaluation, brain (MRI or CT) and arterial (ultrasound or transcranial Doppler) imaging, and an electrocardiogram within 4 hours of admission, followed by an echocardiogram the following day (or urgently if high risk of embolism was suspected) (2007). Subjects were followed to evaluate 90-day stroke rate (2007). During the 2 year study, 1085 patients were admitted to the TIA clinic for suspected TIA (2007). Of those patients, 65% were found to have confirmed TIA or minor stroke and 13% were determined to

have had a possible TIA (2007). All confirmed and possible TIA subjects were immediately started on anti-thrombotic treatment, and when possible antihypertensive and lipid therapies were started at discharge (2007). Primary care providers were provided guidelines regarding blood pressure and lipid control, as well as smoking cessation in the subjects' discharge summaries (2007). The rate of stroke at 90-day follow-up was 1.24%, compared with a predicted rate of 5.96% based on their $ABCD^2$ scores, suggesting a reduction in risk (2007).

2.3. Present TIA Guidelines

Consistent with the studies discussed above, the NSA and AHA have issued evidence-based guidelines for management of TIA (Easton et al., 2009; Johnston et al., 2006). The NSA, recognizing the need for systemic changes to allow consistent implementation of TIA management recommendations, has also issued guidelines for systems of care for TIA (Johnston et al., 2011). Specific guidelines are outlined for initial evaluation, medical treatment, surgical treatment, risk factor management, hospital management, and rapid outpatient evaluation and management (for patients with TIAs who are at low risk for early subsequent stroke, as evidenced by an $ABCD^2$ score of three or less) (2011). Generally, they recommend evaluating patients with acute TIA within 1 working day of presentation, with those at high risk of stroke seen in an ER if rapid evaluation in a TIA clinic is not available (2011). Specific recommendations for a standardized protocol for outpatient TIA management include:

> evaluation by a stroke expert within 48 hours; protocol to assure timely completion of recommended evaluation, including laboratory studies, ECG, brain

> imaging, and carotid vascular imaging, and for appropriate patients, echocardiography and cardiac monitoring; protocol for urgent carotid intervention for appropriate candidates with symptomatic internal carotid artery stenosis >50%; protocol to initiate proven medical and behavioral interventions to reduce subsequent stroke risk, adhering to established evidence-based guidelines; education of the patient and family about stroke risk reduction and identification of, and appropriate response to, new stroke symptoms; [and a] protocol to inform primary care provider of test results and recommendations (2011, p. 876).

Specific recommendations are also presented outlining circumstances in which hospital admission and management may be advisable (Johnston et al., 2006).

2.4. Implementation of Guidelines in Rural Regions

While the guidelines for rapid evaluation and management of patients with TIA are clearly outlined, Johnston et al. suggest that the available interventions to reduce the risk of stroke in the acute period following a TIA have been underutilized (2011). Further, rural populations may be more vulnerable to stroke while also having greater barriers to accessing care (Pearson & Lewis, 1998; Joubert et al., 2008), and there is scarce literature on the implementation of guideline-based practices in rural areas. Parsons et al. (2003), in a systematic review, found a paucity of literature on the topics of barriers to implementation of evidence by health professionals in rural areas, or interventions for implementing evidence-based practice in rural settings. They find this dearth of evidence on these subjects despite significant amounts of research on guideline implementation in other types of settings suggesting the importance of context-specific implementation

(2003; Oxnam, Thomas, Davis, & Haynes, 1995).

A single more recent study conducted in Canada examined barriers to implementation of secondary stroke prevention best practices amongst rural family physicians using a sequential, explanatory mixed methods approach (Warner, Harrold, Allen, & Lyons, 2010). The study centered around a workshop intended to: increase awareness of guidelines; identify barriers to implementation in rural practices; and enable discussion of these topics amongst family physicians, health district representatives, and stroke specialists from a recently implemented stroke clinic, including a nurse practitioner with a health promotion focus (2010). Barriers that arose in the research included difficulties for rural practitioners coordinating care with specialists, communication difficulties within the health district, role conflict among family physicians as to whether health promotion fell within their scope of practice, and time constraints affecting both health promotion counseling and awareness of available resources (2010). The study concluded that the workshop effectively improved communication and reduced barriers to implementation of guidelines, supporting the importance of context in implementation of guidelines in rural settings (2010).

Another recent study, conducted in rural France, used a survey of 85 non-neurologist ER and general practice physicians to assess their familiarity with TIA and related guidelines (Massengo et al., 2013). They found that 59% of respondents were unaware of the newly proposed definition of TIA, and recognition of predictors of early post-TIA stroke recurrence necessitating emergency management of TIA varied (2013). Further, they

found that 39% of respondents were unaware of the French national TIA management guidelines (2013). Of those who were aware of the guidelines, only a quarter considered the guidelines fully implementable in their practice, and one third believed the guidelines were incompatible with their practice (2013). They conclude that poorly updated knowledge regarding TIA amongst non-neurologist ER and general practice physicians may be a contributing factor to sub-optimal TIA management (Massengo et al., 2013). While these findings are interesting in the context of this study, certainly the transferability of these findings may be limited, especially considering that the study was based on a different set of national guidelines.

2.5. Role of Assessing Barriers in the Implementation of Guideline-based Practices

Though research on practice behavior change is limited, the available literature suggests that evaluating factors hindering or motivating behavior change may aid in tailoring implementation of guideline-based practices (Grol, 1992; Grol & Grimshaw, 2003; Grol & Wensing, 2004; Kanouse, Kallich, & Kahan, 1995; Robertson, Baker, & Hearnshaw, 1996). In an early work on this subject, Grol (1992) suggests that implementing guidelines follows a step-by-step process including orientation (becoming informed about a guideline), insight (understanding the guidelines and persuasion of need to change), acceptance (adopting a positive attitude towards the guidelines and intention to change), and change (the actual implementation of the guidelines into practice). He suggests that each step may involve specific barriers, and that it is important to study and be aware of them so that interventions to overcome them may be developed (1992). Further he suggests barriers may exist within practitioners (motivation, attitude, age and experience,

learning style, self-confidence, willingness to change, etc.), as well as within practice settings (social, structural, logistic, and organizational factors).

Kanouse, Kallich, and Kahan similarly argue "How the innovation is viewed by potential adopters along such dimensions as compatibility, complexity, and relative advantage is…important" (1995, p. 182). Robertson, Baker, and Hearnshaw (1996) offer a simple framework suggesting possible strategies for change based on psychological theories for commonly encountered barriers. They state: "An ideal model or framework of methods for changing the clinical behavior of [providers] would indicate what obstacles to change might be encountered in different circumstances and which change strategies would then be most appropriate…An approach that can be used to apply available knowledge to diagnose obstacles to change and then select appropriate treatments or strategies to overcome those obstacles and thus improve the clinical practice of [providers]" (1996, p. 51).

In later work with colleagues, Grol further elaborates that plans for change in practice should be based both on characteristics of the guidelines themselves as well as barriers and facilitators to change (Grol and Grimshaw, 2003):

> "Obstacles to change in practice can arise at different stages in the health-care system, at the level of the patient, the individual professional, the health-care team, the health-care organization, or the wider environment. Most theories on implementation of evidence in health care emphasize the importance of developing a good understanding of such obstacles to develop an effective

> intervention…Study the main difficulties in achieving change, and select a set of strategies and measures at different levels linked to that problem" (2003, p. 1226-9).

Finally, Grol has also suggests provider surveys as a useful means of studying existing barriers to implementation, so that information gleaned may then be used to tailor implementation strategies (Grol, 1992; Grol & Wensing, 2004).

Ajzen and Fishbein's theory of reasoned action is one example of a behavioral theory that provides a framework for assessing determinants of behavior, while also illuminating targets for modifying behaviors (1980). The theory suggests that a person's behavioral intention is influenced by their own attitudes towards performing the behavior, as well as the subjective norms in their environment surrounding the behavior (1980), and meta-analyses have strongly supported the predictive ability of the model (Sheppard, Hartwick, and Warshaw, 1988). However, as Hale, Householder & Greene discuss, in addition to the predictive nature of the model, it highlights attitudes and subjective norms as natural targets for persuasive messages for influencing behavior (2002). Extrapolating to the context of guideline implementation, this suggests that attitudes towards guidelines and the subjective norms surrounding their implementation may both be barriers that may be targeted to improve implementation.

2.6. Summary of the Literature

Evidence has supported various approaches to rapid TIA evaluation as well as the potential for risk factor modification to improve outcomes for patients. The NSA/AHA

TIA guidelines recommend rapid assessment of patients with TIAs within 1 day of presentation for acute TIA patients, with evaluation by a clinical stroke expert within 48 hours (Easton et al., 2009; Johnston et al., 2006; Johnston et al., 2011). However, there is limited literature on implementation of guideline-based practice in rural regions, and the few studies relating to TIA guidelines have suggested that barriers to implementation of evidence-based recommendations may be greater in rural areas, and implementation is most effective when context-specific (Parsons et al., 2003; Warner et al., 2010). The literature available on practice behavior change suggests that evaluating factors hindering or motivating behavior change may aid in tailoring strategies for implementation of guideline-based practices (Grol, 1992; Grol & Grimshaw, 2003; Grol & Wensing, 2004; Kanouse, Kallich, & Kahan, 1995; Robertson, Baker, & Hearnshaw, 1996).

CHAPTER 3: METHODS

3.1. Introduction

This chapter will delineate the methods used in this study to understand ED health care providers perceived barriers to implementation of NSA TIA guidelines. This will include discussion, in turn, of the research design, setting, sampling method, protection of human subjects, study instrument, procedures, and data analysis.

3.2. Design

A descriptive survey design was employed, using an online survey through LimeSurvey to identify ED health care providers' knowledge of TIA guidelines and any perceived barriers to current TIA guideline implementation.

3.3. Setting

The survey was conducted in a rural state preparing for implementation of a standardized rapid TIA evaluation protocol. The survey was conducted online, involving all of the state's 14 hospitals, including rural critical access hospitals, several regional hospitals, and one academic medical center.

3.4. Sampling

All health ED health care providers including nurses, physicians, physician assistants, and nurse practitioners were invited to participate. An email describing the purpose of the study was sent to the ED medical director and nurse manager at each of the states EDs, requesting that they forward the link to the survey to all of the ED's providers and

nurses at their institution. The survey remained open over a three month period. Reminder emails were sent monthly, and at two weeks, and one week prior to survey closure to encourage participation.

3.5. Protection of Human Subjects

The study was reviewed by the University of Vermont Committees on Human Research and determined to be exempt research under 45 CFR 46.101(b), Exemption Two, regarding survey research. As the survey questions were not of a sensitive nature and were completed anonymously, the survey posed minimal psychological or social, and no physical risk to the participants. The introductory description of the survey described that consent to participate in the study is implied by submission of the questionnaire and clearly stated that survey participation was voluntary.

3.6. Study Instrument

A modified version of the Barriers and Facilitators Assessment Instrument (BFAI) was used in this study along with five supplemental questions assessing knowledge of TIA guidelines. The BFAI is a validated, modifiable questionnaire designed to assess four categories of potential barriers to guideline implementation, including innovation characteristics, care provider characteristics, patient characteristics, and characteristics of the organizational, social, political, and societal context (Harmsen, Peters, & Wensing, 2005). Cronbach's alpha's for innovation, professional, patient, and context characteristics, respectively, were 0.65, 0.63, 0.68, and 0.66 (2005).The questions in the BFAI were modified for clarity and specificity to the study's topic and ED setting.

The modified BFAI included 28 questions answered on a 5-point Likert scale (ranging from 'Fully Agree' to 'Fully Disagree'). Additionally, respondents were asked to provide demographic information including their clinical role (physician, nurse, nurse practitioner, or physician assistant), gender, years of clinical experience, level of education, and the hospital at which they're employed. The hospital of employment was of interest so that the data could be analyzed by hospital type (critical access vs. non-critical access), and also so that perceived barriers at particular institutions could be further understood and addressed in the states' anticipated rollout of a rapid TIA assessment program. Permission for use of this instrument was obtained from its corresponding author. Formatting and presentation of the online study instrument was guided by the Tailored Design Method (Dillman, Smyth & Christian, 2009). The study instrument was reviewed by two TIA experts for content validity, and was pilot tested by 3 health professionals for clarity.

3.7. Study Procedures

Prospective participants were provided a description the study and invited to complete the survey as described above in the sampling section. Participants first provided demographic data and answered questions reflecting their knowledge of present TIA guidelines. After answering initial knowledge questions, participants were presented a brief, educational overview of the guidelines. The overview of the guidelines was provided to ensure sufficient awareness of the present TIA guidelines so that participants could adequately complete the BFAI that followed.

3.8. Data Analysis

This preliminary study used descriptive statistics. Respondent demographics are presented as percentages. Frequencies of responses identifying each survey item as a barrier are described as percentages. Results from the TIA knowledge portion of the questionnaire were analyzed for the percentage of correct and incorrect responses. The TIA guideline knowledge and barrier data were evaluated both in aggregate, and by hospital type—critical access vs. non-critical access. A post-hoc analysis in SPSS, using Pearson Chi-Square tests to assess for differences between the two groups, was performed.

CHAPTER 4: RESULTS

4.1. Demographics

Respondent demographics are summarized in Table 1 below. Thirty-nine ED health care providers completed the survey including 14 physicians, one nurse practitioner, and 24 registered nurses. Sixty-four percent of respondents were female, 33% male, and one respondent did not indicate gender. Respondents from all experience ranges, from 0 to 5, to greater than 30 years in the profession were represented. Eleven of the 14 hospitals in the state were represented in the responses; 30.8% of respondents worked at critical access hospitals, while the remainder worked at non-critical access regional hospitals or an academic medical center.

Table 1: Respondent demographics

Demographic		Critical Access Respondents (n=12; 30.77%)	Non-Critical Access Respondents (n=27; 69.23%)	All Respondents (n=39)
Gender:	Female	66.67% (8)	62.96% (17)	64.10% (25)
	Male	33.33% (4)	33.33% (9)	33.33% (13)
	No answer	0.00% (0)	3.70% (1)	2.56% (1)
Profession:	RN	41.67% (5)	70.37% (19)	61.54% (24)
	Physician	50.00% (6)	29.63% (8)	35.90% (14)
	NP	8.33% (1)	0.00% (0)	2.56% (1)
	PA	0.00% (0)	0.00% (0)	0.00% (0)
Years in Profession:	0-5	8.33% (1)	11.11% (3)	10.26% (4)
	6-10	16.67% (2)	18.52% (5)	17.95% (7)
	11-20	16.67% (2)	18.52% (5)	17.95% (7)
	21-30	25.00% (3)	33.33% (9)	30.77% (12)
	≥31	25.00% (3)	18.52% (5)	20.51% (8)
	No answer	8.33% (1)	0.00% (0)	2.56% (1)

4.2. TIA Guideline Knowledge

A summary of the percentage of correct responses to each question or item is presented in Table 5. Forty-four percent (17/39) of respondents correctly identified all of the presented characteristics consistent with the current definition of TIA, while no respondents correctly identified all items consistent with the current TIA evaluation timeline recommendations. Fifty-nine percent (23/39) of respondents correctly identified that MRI/CT, carotid vascular imaging, and ECG are recommended within 24 hours following an acute TIA. Thirty-three percent (13/39) of respondents correctly identified that 25 to 50% of strokes that follow within 90 days of a TIA occur within the first 48 hours. Twenty-eight percent (11/39) of respondents correctly identified the subsequent 90-day risk of stroke being higher for patients experiencing a TIA than those experiencing a minor ischemic stroke. Table 5 breaks down these results further by the respondent's hospital type. Post-hoc Chi-Square tests revealed no significant differences in TIA guideline knowledge between critical access and non-critical access hospital respondents.

4.3. Perceived Barriers

The percentage of respondents identifying each survey item as a barrier is presented in Table 3, both in total, and broken down by critical access hospital vs. non-critical access hospital.

The most frequently perceived barriers to TIA guideline implementation, identified by greater than 50% of all respondents as barriers, are delineated in Table 2.

Table 2: Most frequently perceived barriers (all respondents)

Perceived barrier	Percentage of all respondents identifying
It is difficult to give adequate preventive care to patients with a low socio-economic status in an ED/hospital setting due to patient difficulties accessing appropriate follow-up care and/or medications	72.7
It is difficult to convince older patients to adopt preventive medical and lifestyle changes	66.7
It is difficult to provide care as outlined within the present TIA guidelines as the instruments/facilities needed for the requisite testing may not be available during the time the patient is in our ED/Hospital	66.7
I think TIA patients are often resistant to the degree or types of lifestyle changes implicated in the present TIA guidelines	66.7
Providing preventive care is difficult as there is commonly not enough support staff available	63.6
I wish to know more about the present TIA guidelines before I decide to apply them	54.5

Amongst critical access respondents, the most frequently perceived barriers to TIA guideline implementation, identified by 50% of respondents or more, are delineated in Table 3.

Table 3: Most frequently perceived barriers (critical access respondents)

Perceived barrier	Percentage of all respondents identifying
It is difficult to give adequate preventive care to patients with a low socio-economic status in an ED setting due to patient difficulties accessing appropriate follow-up care and/or medications	80.0
It is difficult to provide care as outlined within the present TIA guidelines as the instruments/facilities needed for the requisite testing may not be available during the time the patient is in our ED	80.0
I think TIA patients are often resistant to the degree or types of lifestyle changes implicated in the present TIA guidelines	80.0
It is difficult to convince older patients to adopt preventive medical and lifestyle changes	70.0
A full evaluation as recommended in the guidelines is too lengthy to be feasibly completed in our busy ED setting	70.0
From my experience, I am concerned that primary care providers will not cooperate in applying the present TIA guidelines	70.0
I think TIA patients are often resistant to the amount or types of medical care implicated in the present TIA guidelines	60.0
From my experience, I am concerned that fellow ED/hospital providers and/or staff will not cooperate in applying the present TIA guidelines	60.0
I wish to know more about the present TIA guidelines before I decide to apply them	60.0
Providing preventive care is difficult as there is commonly not enough support staff available	50.0
It is difficult to give preventive care as physical space (e.g. consultation room) is limited in our ED	50.0
I think TIA patients are often resistant to the amount or types of testing suggested in the present TIA guidelines	50.0

Amongst non-critical access respondents, the most frequently perceived barriers to TIA guideline implementation, identified by 50% of respondents or more, are delineated in Table 4.

Table 4: Most frequently perceived barriers (non-critical access respondents)

Perceived barrier	Percentage of all respondents identifying
It is difficult to give adequate preventive care to patients with a low socio-economic status in an ED setting due to patient difficulties accessing appropriate follow-up care and/or medications	69.6
Providing preventive care is difficult as there is commonly not enough support staff available	69.6
It is difficult to convince older patients to adopt preventive medical and lifestyle changes	65.2
It is difficult to provide care as outlined within the present TIA guidelines as the instruments/facilities needed for the requisite testing may not be available during the time the patient is in our ED	60.9
I think TIA patients are often resistant to the degree or types of lifestyle changes implicated in the present TIA guidelines	60.9
I feel I am not adequately prepared to educate patients of different cultural backgrounds about preventive care	52.2
I wish to know more about the present TIA guidelines before I decide to apply them	52.2

Post-hoc Chi-Square tests revealed a significant difference between the critical access and non-critical access respondents on only perceived barrier number nine (“From my experience, I am concerned that primary care providers will not cooperate in applying the present TIA guidelines”) which was identified as a barrier by 70.0% of critical access respondents and 13.0% of non-critical access respondents ($p=0.003$).

CHAPTER 5: DISCUSSION

5.1. Introduction

Though preliminary, the descriptive data from this study yields several interesting findings, related to both knowledge of the TIA guidelines and perceived barriers to using them amongst ED health care providers in a rural state.

5.2. TIA Guideline Knowledge

A majority of survey participants responded incorrectly to all but one of the knowledge-based questions in the survey, suggesting a knowledge deficit of the guidelines themselves is a significant barrier to the guidelines being practiced. This finding is corroborated by 54.5% of respondents identifying "I wish to know more about the present TIA guidelines before I decide to apply them" as a barrier. This finding seems especially significant considering that two of the questions that a majority of respondents answered incorrectly related to the timeframe in which TIA patients should have evaluation, with no respondents identifying all of the evaluation timeline recommendations correctly in question two, and 41.03% of respondents not identifying that completion of brain imaging, carotid imaging, and ECG is recommended within 24 hours of an acute TIA in question three. Also noteworthy, is that knowledge of the guidelines did not significantly differ between critical access and non-critical access respondents. As awareness was low amongst both groups, this suggests that efforts at improving awareness of the guidelines should be broadly targeted.

These findings are consistent with previous work suggesting low awareness of TIA

guidelines (Massengo et al., 2013). In addition to suggesting a need for provider education on the TIA guidelines as part of the involved state' rapid TIA evaluation program, more generally it supports a need for further research on guideline implementation in rural regions. Means of guidelines dissemination and strategies for increasing providers' knowledge of guidelines may be topics for further pursuit.

5.3. Perceived Barriers

A broad range of perceived barriers were identified by study respondents. The most commonly perceived barriers spanned the barriers and facilitators assessment instrument categories of care provider characteristics (knowledge & motivation), patient characteristics (motivation to change; age; financial situation/economic status), and context characteristics (facilities; support staff). The breadth of the identified barriers is consistent with Grol & Grimshaw's work suggesting that obstacles to practice change present at a variety of levels including the patient, professional, health care team, health-care organization, and the wider environment (2003). As previously discussed, the literature on the role of assessing barriers in the implementation of guideline-based practices suggests that each of these identified perceived barriers, as well as associated attitudes and subjective norms, represent possible targets for intervention in the state in which the study was conducted. While generalizability of the specific barrier results to other states or contexts cannot be assumed due to the study being conducted in a single rural state, the method of evaluation represents a potentially transferable model for similar barrier assessments in other states or settings.

The one statistically significant difference identified in the post-hoc analysis was the frequent identification of “From my experience, I am concerned that primary care providers will not cooperate in applying the present TIA guidelines” as a barrier amongst the critical-access hospital respondents (70.0% vs. 13.0% for non-critical access respondents; p=0.003). As an example of context specific implementation strategies, this perceived barrier may suggest an importance of broad-based provider education strategies in efforts at TIA guideline implementation in the state’s critical access hospital regions, in an effort to illicit confidence amongst providers that professional colleagues are adequately familiar with the guidelines. Again considering context specific implementation, and perhaps reflecting a difference in demographics, respondents from the non-critical access hospitals more frequently identified “I feel I am not adequately prepared to educate patients of different cultural backgrounds about preventive care” as a barrier (52.5% vs. 30.0%).

5.4. Limitations

This study had a number of limitations. The size of the study was small, limiting its power to identify significant differences between respondent groups. While invitations and requests to forward information about the study to all ED providers were sent to all of the states ED medical directors and nurse managers, respondents only represented 11 of the state’s 14 hospitals, and it not possible to know with certainty whether the study invitation was forwarded to all active ED providers in the state. Additionally, while the total number of ED providers in the state is unknown, the total number of respondents is believed to represent a minority of the total population.

The BFAI, has been tested for reliability, however, the Cronbach's alphas for the instrument are less than optimal falling in the 0.63 to 0.68 range. The BFAI was designed to be modifiable and adaptable; however, changes made to the instrument for improved specificity to the TIA guidelines could also have affected its reliability. The TIA guideline knowledge questions were reviewed by content experts for content validity, and pilot tested with a small sample, but specific measures of reliability were not obtained.

While an educational summary of the TIA guidelines was presented to all study participants after completing the knowledge questions to ensure sufficient awareness of the guidelines to respond to the BFAI, it's possible that the low prior awareness of the guidelines found in the study could have influenced respondents ability to perceive potential barriers to implementation. Finally, as mentioned above, while the results are likely generalizable to the state in which the study was conducted, whether the results are generalizable to other regions is unclear.

5.5. Conclusion

The most notable finding of this descriptive study was a low awareness of the present TIA guidelines amongst ED providers in a rural state. This is consistent with prior work on the subject (Massengo et al., 2013) and suggests a need for further study on methods of disseminating and ensuring provider awareness of such guidelines in rural regions. A wide range of barriers to implementation of the present TIA guidelines were identified and may serve both as a basis for context-specific guideline implementation efforts in the

state, while also offering a potential model for similar barriers assessments in other regions.

Table 5: TIA guideline knowledge question summary

TIA Guideline Knowledge Question:		Correct Answer:	Percentage (number) of respondents selecting correctly:		
			Critical Access Respondents (n=12)	Non-Critical Access Respondents (n=27)	All Respondents (n=39)
1. TIA Definition: TIA may include which of the following?	a. Rapid onset focal neurological deficit	True	100.00 (12)	92.59 (25)	94.87 (37)
	b. Focal cerebral ischemia	True	75.00 (9)	81.48 (22)	79.49 (31)
	c. Permanent cerebral infarction	False	91.67 (11)	92.59 (25)	92.31 (36)
	d. Symptoms lasting less than 1 hour	True	66.67 (8)	96.30 (26)	87.18 (34)
	e. Symptoms lasting as long as 24 hours	True	75.00 (9)	74.07 (20)	74.36 (29)
	f. Normal neuroimaging results	True	91.67 (11)	92.59 (25)	92.31 (36)
	Respondents identifying all of the above correctly		25.00 (3)	51.85 (14)	43.59 (17)
2. Which of the following are true regarding evaluation of TIA?	a. All patients with TIA symptoms within the last 24 hours should be evaluated immediately in the ED	True	66.67 (8)	92.59 (25)	84.62 (33)
	b. All TIAs represent high risk of stroke and should be evaluated urgently within the ED regardless of how long ago the TIA occurred	False-prompt evaluation, but not urgent ED evaluation is required for patients reporting remote TIA symptoms	50 (6)	33.33 (9)	38.46 (15)
	c. Patients calling to report resolved TIA symptoms within the past 1-7 days should be evaluated within 3 days of their report	False-evaluation on day of report whenever possible	50 (6)	37.04 (10)	41.03 (16)
	d. Consultation by a clinical stroke expert for patients who are managed outpatient following an acute TIA is recommended within 1 week	False- evaluation by stroke expert recommended within 24-48 hours	25 (3)	33.33 (9)	30.77 (12)
	E. Prompt evaluation for patients reporting TIA symptoms greater than 7 days ago	True	58.33 (7)	44.44 (12)	48.72 (19)
	Respondents identifying all of the above correctly		0.00% (0)	0.00% (0)	0.00% (0)

Table 5 (continued): TIA guideline knowledge question results

TIA guideline knowledge question:	Possible answers (correct answer in bold)	Percentage (number) of respondents selecting:		
		Critical access respondents (n=12)	Non-critical access respondents (n=27)	All respondents (n=39)
3. Testing, including MRI/CT, carotid vascular imaging, and ECG are recommended within what time period following an acute TIA?	**a. 24 hours**	**58.33 (7)**	**59.26 (16)**	**58.97 (23)**
	b. 2 days	33.33 (4)	18.52 (5)	23.08 (9)
	c. 5 days	8.33 (1)	14.81 (4)	12.82 (5)
	d. 10 days	0.00 (0)	7.41 (2)	5.13 (2)
4. Greater than 10% of patients experiencing TIA will have a stroke within 90 days. What percentage of those strokes will occur within 48 hours following the TIA?	a. 4-8%	16.67 (2)	33.33 (9)	28.21 (11)
	b. 10-20%	41.67 (5)	18.52 (5)	25.64 (10)
	c. 25-50%	**41.67 (5)**	**29.63 (8)**	**33.33 (13)**
	d. 60-75%	0.00 (0)	18.52 (5)	12.82 (5)
	e. >75%	0.00 (0)	0.00 (0)	0.00 (0)
5. The risk of subsequent stroke within 90 days of an event is:	a. Greater for patients experiencing minor ischemic stroke than TIA	25.00 (3)	37.04 (10)	33.33 (13)
	b. Equal for patients experiencing minor ischemic stroke and TIA	50.00 (6)	33.33 (9)	38.46 (15)
	c. Greater for patients experiencing TIA than minor ischemic stroke	**25.00 (3)**	**29.63 (8)**	**28.21 (11)**

Table 6: BFAI results

BFAI Question	Percentage of Respondents Identifying Item as Barrier		
	Critical Access Respondents (n=10, unless otherwise indicated)	Non-Critical Access Respondents (n=23, unless otherwise indicated)	All Respondents (n=33, unless otherwise indicated)
1. The present TIA guidelines leave enough room for me to make my own conclusions	10.0	17.4	15.2
2. The present TIA guidelines leave enough room to weigh the wishes of the patient	10.0	13.0	12.1
3. The present TIA guidelines are a good starting point for continuing to update my TIA knowledge	0.0	0.0	0.0
4. I did not thoroughly read nor remember the present TIA guidelines	20.0	21.7	21.2
5. I wish to know more about the present TIA guidelines before I decide to apply them	60.0	52.2	54.5
6. Changing the way I've routinely provided care is difficult for me	10.0	8.7	9.1
7. I think parts of the present TIA guidelines are incorrect, or leave out important considerations	20.0	21.7	21.2
8. I believe that working to provide care according to protocols does not necessarily lead to the best care for the individual patient	33.3 (n=9)	13.0	18.8 (n=32)
9. From my experience, I am concerned that primary care providers will not cooperate in applying the present TIA guidelines	70.0	13.0	30.3
10. From my experience, I am concerned that fellow ED/hospital providers and/or staff will not cooperate in applying the present TIA guidelines	60.0	17.4	30.3
11. From my experience, I am concerned that managers/directors will not cooperate in applying the present TIA guidelines	20.0	8.7	12.1

Table 6 (continued): BFAI results

BFAI Question	Percentage of Respondents Identifying Item as Barrier		
	Critical Access Respondents (n=10, unless otherwise indicated)	Non-Critical Access Respondents (n=23, unless otherwise indicated)	All Respondents (n=33, unless otherwise indicated)
12. I think TIA patients are often resistant to the amount or types of testing suggested in the present TIA guidelines	50.0	47.8	48.5
13. I think TIA patients are often resistant to the amount or types of medical care implicated in the present TIA guidelines	60.0	39.1	45.4
14. I think TIA patients are often resistant to the degree or types of lifestyle changes implicated in the present TIA guidelines	80.0	60.9	66.7
15. A full evaluation as recommended in the guidelines is too lengthy to be feasibly completed in our busy ED setting	70.0	39.1	48.5
16. The present TIA guidelines would be difficult to fit into my practice flow	30.0	30.4	30.3
17. Institutional reimbursement for a TIA ED visit is likely inadequate for completion of the suggested evaluation	40.0	30.4	33.3
18. The layout of the present TIA guidelines (as published in journal articles) make them handy to use	33.3 (n=9)	13.0	18.8 (n=32)
19. Providing preventive care is difficult as there is commonly not enough support staff available	50.0	70.0	63.6
20. It is difficult to provide care as outlined within the present TIA guidelines as the instruments/facilities needed for the requisite testing may not be available during the time the patient is in our ED/hospital	80.0	60.9	66.7
21. It is difficult to give preventive care as physical space (e.g. consultation room) is limited in our ED	50.0	36.4 (n=22)	40.6 (n=32)
22. It is difficult to give preventive care because I'm not trained in giving preventive care	30.0	17.4	21.2
23. It is difficult to give preventive care because I'm not trained in motivating patients to make lifestyle changes	10.0	26.0	21.2
24. It is difficult to give preventive care to patients with a different cultural background	30.0	47.8	42.4

Table 6 (continued): BFAI results:

BFAI Question	Percentage of Respondents Identifying Item as Barrier		
	Critical Access Respondents (n=10, unless otherwise indicated)	Non-Critical Access Respondents (n=23, unless otherwise indicated)	All Respondents (n=33, unless otherwise indicated)
25. I feel I am not adequately prepared to educate patients of different cultural backgrounds about preventive care	30.0	52.2	45.45
26. I find it difficult to convince "healthy-appearing" patients to adopt preventive medical and lifestyle changes	40.0	17.4	24.2
27. It is difficult to convince older patients to adopt preventive medical and lifestyle changes	70.0	65.2	66.7
28. It is difficult to give adequate preventive care to patients with a low socio-economic status in an ED setting due to patient difficulties accessing appropriate follow-up care and/or medications	80.0	69.6	72.7

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