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Impact of the Advanced Practice Registered Nurse on the Stroke Patient Population

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DNP Final Project Report

Impact of the Advanced Practice Registered Nurse on the Stroke Patient Population

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College of Nursing

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Dedication

This work and my DNP Project is dedicated to my husband, who has always managed to talk me into finishing this degree regardless of the trials it has presented. This is for everything we have put on hold for the sake of a brighter tomorrow. This is for my parents, who are even more proud of me than I am of myself. This is for my sister, who gets me. This is for my brother, in hopes that my fight and hunger for this will encourage him to follow his dreams. This is for my sweet fur babies, Riley (who knows when to come cuddle) and Porter (who knows when its time to get mom away from the computer). This is for nursing everywhere I hope to make the change I so strongly desire.

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Abstract

PURPOSE: The purpose of this study is evaluate the APRN care model utilized for stroke patients by examining the pre and post impact on outcomes of the stroke clinical practice guidelines (CPGs), patterns of service use, stroke patient outcomes, and patient satisfaction.

METHODS: This study was a single-center, pre-post implementation retrospective study of the impact for the stroke APRN care model on the stroke patient population at Norton Brownsboro Hospital. The sample consisted of 145 patients for the pre-implementation period, March 2012 to August 2012, and 202 patients for the post-implementation period, March 2014 to August 2014.

RESULTS: No differences in age, sex, ethnicity, comorbid burden, and diagnosis code were found between the pre and post groups. Patients managed by the APRNs had a significantly shorter LOS (P=<.001), decreased ICU recidivism (P=.01), reduced inpatient mortality, and increased discharges to home (P=.02). No differences were found between groups in readmission rates or patient satisfaction. The APRN managed group had a median decreased LOS of two days, resulting in an approximated cost savings of $628,056.00 in six months.

CONCLUSION: Clinical and financial outcomes were significantly improved by implementing an APRN care model. In a healthcare environment where quality and cost efficient care is paramount, the APRN care model is effective in achieving these initiatives. Adding an APRN to the health care team sets the standard for quality patient care and reducing hospital-associated costs.

Impact of the Advanced Practice Registered Nurse for the Stroke Patient Population

Introduction

The growing patient population and attention on healthcare policy has forced the nation to rethink and reengineer the delivery of patient care. The emphasis on lowering costs and improving quality of care is allowing advanced practice registered nurses (APRNs) the opportunity to demonstrate competence in providing excellent patient care. In recent years, there has been a lack of research to examine the benefits of adding an APRN to the health care team.

Organizations such as the Institute of Medicine (IOM) and the National Organization of Nurse Practitioner Faculties (NONPF) have expressed a need for new current research, to quantify the importance of the APRN (NONPF, 2013). With current and future challenges of physician shortages and increased patient acuity and census, it is important to provide evidence that APRNs are of added value to the healthcare teams. The IOM has recommended that new models of care delivery are needed to alleviate the impending provider shortage. We address this need for new models of care delivery by designating and evaluating the role of an APRN as a hospital's stroke coordinator. Hence, the aim of this study is to evaluate the impact of the APRN addition to the health care team on the stroke patient population.

Background

The enactment of the Patient Protection and Affordable Care Act, the aging baby boomer population, and insufficient physician availability all have researchers speculating about how to best meet future patient needs. Access to patient providers is an already strained system and with the estimated physician shortage of approximately 90,000 physicians by the year 2020 alternative provider care models must be examined (Gallegos, 2014). To ameliorate this strain, the U.S. Department of Health and Human Services (DHHS), whose primary role is to develop

strategies to meet the health care needs of the American people, has stated that APRNs can assist with the anticipated provider shortages (Oliver, Pennington, Revelle, & Rantz, 2014). In fact, evidence suggests that APRNs deliver high quality, cost effective care (Oliver et al., 2014). Such information is paramount to demonstrate that APRNs are capable providers and should be a key component to meet care needs as the physician shortage reduces patient access to providers.

Healthcare is being rapidly reformed, and the need for high quality, safe, and efficient patient care models continues to rise. Norton Healthcare (NH), like many other healthcare facilities in Kentucky, is utilizing APRNs to meet patient and regulatory demands. The Brownsboro Norton Neurology Medical group, for example, utilizes an APRN as the designated stroke coordinator. Working in collaboration with a multidisciplinary team, the APRN's goals are to ensure that all stroke patients receive all applicable evidence based practice interventions during their admission.

Norton Healthcare has invested over seven million dollars to develop 150 registered nurses into APRNs with a Doctor of Nursing Practice (DNP) degree. According to Stanik-Hutt et al. (2013), "we need to know to what extent NPs contribute to the quality, safety, and effectiveness of health care" (p. 492). By evaluating the current APRN stroke service line, NH can provide data on outcomes, effectiveness, and quality care delivered by APRN care models.

Purpose

According to the available research, an APRN care model can provide quality care, help improve patient provider access, and ultimately improve patient outcomes. The purpose of this study is to evaluate the impact of the APRN care model utilized for stroke patients at Norton Brownsboro Hospital (NBH) by examining the pre- and post- care model implementation outcomes of the stroke clinical practice guidelines (CPGs), patterns of service use, stroke patient

outcomes, and patient satisfaction. Prior to and after implementation of the APRN care model, the questions to be addressed are:

1. What are the changes in provider adherence to the stroke clinical practice guidelines for ischemic and hemorrhagic strokes?

2. What are the changes in service use, specifically readmission rates (both seven and thirty day), length of hospitalization, and recidivism to the intensive care unit (ICU)?

3. What are the changes in stroke patient outcomes (i.e., patient discharge disposition)?

4. What are the changes to the patient satisfaction rates?

Methods

This study was a single-center, pre-post implementation retrospective report of the impact for the stroke APRN care model on adherence of CPGs, service use, patient outcomes, and patient satisfaction for the stroke patient population at Norton Brownsboro Hospital. The NBH stroke APRN care model was evaluated pre and post-implementation of the APRN position to the healthcare team. Norton Brownsboro Hospital has a designated APRN stroke coordinator. At the time of the study the NBH neurology service line included one APRN stroke coordinator, three physicians, and specialized in the stroke patient population. Norton Brownsboro Hospital implemented the APRN position in December of 2012. Pre implementation of the APRN (prior to December 2012) included only the three physicians and no other provider types. They have since added physicians to the practice.

Setting

The Norton Healthcare (NH) system is the largest in the Louisville, KY region and includes five main hospitals and many urgent care centers offering the residents of Kentucky and Southern Indiana a full range of medical services. Of the five main hospitals, Norton

Brownsboro Hospital (NBH) will be the focus of this study. NBH provides services to residents in the eastern and Oldham county area of the Louisville Metro area. NBH is a 127-licensed bed acute care hospital. It is the newest addition to the Norton system. In 2015 NBH became the only hospital in the NH system to have achieved the comprehensive stroke center certification. The NBH stroke service line was chosen for this project because there were no changes to the physicians or APRN during the time frame selected, helping reduce provider variability.

Sample

The sample consisted of the medical records of 145 patients for the pre-implementation period and 202 patients for the post-implementation period. The patient population of interest was patients diagnosed with a stroke at or during admission. The records of all patients who met the inclusion criteria between March 2012 and August 2012 (pre APRN implementation) and between March 2014 and August 2014 (post APRN implementation) were included. Both pre- and post-implementation outcomes were compared. Inclusion criteria for the patients records used in the study were: patients diagnosed with stroke, including ischemic and hemorrhagic strokes (please refer to Table 1 for a comprehensive list of ICD-9 diagnosis codes used for inclusion criteria at or during admission); admitted pre-implementation of the APRN Care model between March 2012 and August 2012; admitted post-implementation of the APRN Care model between March 2014 and August 2014; age 18 and above; and English speaking. Exclusion criteria were: patients who did not have a new stroke diagnosis at or during admission, and less than 18 years old. Transient ischemic attacks (TIAs) were excluded from the clinical practice guidelines and they are not required to be reported to Joint Commission.

Features

  Inpatient Services. Three physicians and the APRN stroke coordinator make up the current team on the NBH neurology service line. The APRN is employed by NBH, while Norton Medical Group employs the neurologists. The APRN and neurologists work collaboratively to care for the stroke patient population at NBH. The APRN rounds on the floor from 8am-5pm on weekdays and a stroke neurologist is on-call at all times. The APRN rounds on each admitted stroke patient each weekday to ensure comprehensive stroke care is provided.

  APRN Daily Routine. Each day the APRN updates her patient list and starts rounding on the most critical patients first. She then moves on to the more stable patients. During this time the APRN must assess each patient's condition and needs, collaborate on treatment plans, educate, and dictate progress notes on all stoke patients. The APRN collaborates with floor staff, pharmacy, social workers, and care management to meet all of the inpatient and expected outpatient needs. The APRN and physicians work in collaboration, reviewing the patient cases together to ensure all evidence based clinical practice guidelines (CPGs) are being met.

  Evaluation Duration. The service line was evaluated for six months from March to August 2012 pre APRN implementation and for six months, March to August 2014, approximately one and a half years post APRN implementation. The evaluation was performed one and a half years post implementation to ensure stability of the role and responsibilities of the APRN stroke coordinator. Selecting the same month time frames accounts for potential seasonal variation.

Data Collection

  Approvals from the University of Kentucky Institutional Review Board (IRB) and the Norton Healthcare Office of Research and Administration (NHORA) were obtained prior to the

collection of data. This study was based on a retrospective chart review. Patient charts were obtained from the NBH electronic patient database. Charts were identified using the ICD-9 codes listed in Table 1. During data collection, patient records were accessed using the patient medical record number (MRN), data was abstracted based on the list below, and data was transferred to an electronic spreadsheet. The patient and satisfaction survey records were obtained from the Norton Brownsboro Hospital CIA electronic database. Please refer to Table 2 for a list of variables that were reviewed, which included demographic variables (age, ethnicity, sex, co-morbidity), outcome variables (clinical practice guideline adherence, service use, and patient outcomes), and patient satisfaction.

Data Analysis

Descriptive statistics, including frequency distributions, means, and SD were used to describe patients' demographic characteristics. Continuous variables were compared using the Independent Sample *t*-tests. For categorical variables the chi-squared test for independent samples was used, or Fishers exact test if values were less than 5 in any cell. The Mann-Whitney *U*-test was used in the analysis of the ordinal data from patient satisfaction questionnaires. All analysis was conducted using SPSS version 22; an [*alpha*] level of .05 was used for statistical significance throughout.

<div align="center">

Results

</div>

Sample Characteristics

A total of 347 patient charts were reviewed: 145 prior to the APRN care model implementation and 202 post APRN care model implementation. The mean age for both groups was 68 years old, with the majority of patients being Caucasian, and over half were female (54.6%). The pre and post APRN group's demographic characteristics as to age, sex, ethnicity,

and diagnosis code are presented in Table 3. The group's demographics did not differ

significantly, demonstrating similarities between the groups.

Patients' comorbidities were individually assessed and then a comorbid burden or sum of

comorbidities was calculated to assess and compare the acuity of the two groups. The individual

comorbid assessment found no statistical difference between groups for congestive heart failure

(CHF), chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM), or

hyperlipidemia (HLD). It is of note that there was a statistical difference between the groups in

patients with hypertension (HTN; Pre 76.6%, Post 65.3% P=.025) and coronary artery disease

(CAD; Pre 19.3%, Post 30.7% P=.017). To best capture the acuity of the groups an additional

variable in the form of comorbidity burden was created and assessed. This calculated the sum of

each patient's individual comorbidities and the groups were compared using a t-test. No

statistical difference was found between the groups, supporting similar patient acuity pre and

post APRN implementation (Table 4).

Clinical Practice Guideline Adherence

As a whole, clinical practice guideline (CPG) adherence pre and post implementation of

the APRN was high. There was only one CPG measure that was statistically different from the

pre to post group. The stroke 1 (STK1), defined as the venous thromboembolism prophylaxis

CPG, was met 100% of the time post implementation of the APRN care model whereas it was

only met 96.9% (P=.03) of the time pre implementation. All other CPGs were not statistically

different, but overall provider adherence remained high. Each of the groups' CPGs were

analyzed using the chi-squared method. When a stroke (STK) therapy was not indicated for the

patient diagnosis code they were excluded from receiving the CPG treatment per the guideline

recommendations, and as such these patients were excluded from the statistical analysis.

Service Use

Overall length of stay for patients in the study was significantly (P=<.001) shorter in the APRN care model group with a median of three days, and in the pre APRN group with a median of five days for an overall decreased LOS of two days. The median was used as the data was skewed and this removes the variability from outliers. Financial results were calculated using Kaiser States Health facts statistics for the average cost per inpatient day for a nonprofit hospital in the state of Kentucky. In 2014 the average cost per inpatient day for a nonprofit hospital in the state of Kentucky was $1716.00 (The Kaiser Family Foundation, 2015). Savings were estimated by multiplying reduction in LOS by the cost per patient day.

The ICU recidivism rates included patients that required readmitting to the ICU after they had been transferred to a lower level of care. The ICU recidivism rates for the pre APRN group were 5.5% and were significantly reduced in the post APRN group to 1.0% (P=.01). Rates for recidivism to the ICU during hospitalization decreased by 4.5% in the post APRN implementation group. The sample size for this variable is relatively small in both groups and may require a larger sample to determine a trend in outcomes.

Only patients who survived their hospital stay were included in the readmission analysis. There was no significant difference between groups for either 7-day or 30-day readmissions (refer to Table 5).

Patient Outcomes

To assess patient outcomes, the discharge disposition for each group was collected and analyzed. The discharge categories include home/home health, skilled nursing facility (SNF)/rehab, deceased, hospice, and other. The other category was created due to few cases in each category; this includes short stay, discharged to law enforcement, and left against medical

advice patients. There was a statistical difference in patient discharge disposition between the pre- and post- implementation groups (P=.02). In the post APRN group there was a higher percentage of patients discharged to home/home health and hospice. In the pre APRN group there was a higher percentage of patients discharged to SNF/rehab and a higher percentage of those who expired in the hospital. Figure 1 illustrates the hospital discharge disposition for each group.

Patient Satisfaction

In the pre APRN implementation group a total of 41 patients returned satisfaction surveys after their discharge from the hospital, giving a response rate of 31.5%. In the post APRN group a total of 47 patients returned a satisfaction survey, giving a response rate of 27.3%. Not all patients answered every question. Overall, patients appeared highly satisfied with the level of care they received in both the pre and post APRN implementation groups.

For the questions that used a Likert scale for responses, the Mann-Whitney U test was performed. For the question regarding hospital ranking a t-test was performed, and for the categorical questions a chi-square test was performed. There were no statistical differences found between the two groups for any of the patient satisfaction questions. Please see Appendix for an example of the hospital consumer assessment of healthcare providers and systems (HCAHPS) patient satisfaction survey the patients were asked to complete.

Discussion

This study aimed to better understand the impact on CPG adherence, service use, patient outcomes, and satisfaction of adding an APRN care model to the stroke inpatient service line. As the patient population and provider shortage increase it is crucial that alternative models of care be developed. Common trends in the data show that when APRNs are placed into hospital

settings, the patient and staff satisfaction, patient safety, and patient outcomes all increase. Adding an APRN care model to a service line allows for increased collaboration of providers in order to best meet the healthcare demands of the growing patient population. Overall the study results and analysis demonstrate that an APRN care model significantly improved length of stay, ICU recidivism, and patient outcomes.

Clinical Practice Guideline Adherence

Clinical practice guidelines are a set of evidence-based guidelines to provide recommendations to optimize patient care. They are recognized nationally and impact hospital reimbursement. The APRN care model group had increased provider adherence for the STK1: VTE prophylaxis CPG, which helps decrease patient risk for developing a venous thromboembolism. This is important as the stroke patient populations are at an increased risk for developing deep vein thrombosis (Joint Commission, 2016). Similar APRN care models have been shown to increase adherence to CPGs in other medical areas such as deep vein thrombosis (DVT) prevention (Morris et al., 2012), stress ulcer-bleeding prophylaxis, and anemia management (Gracias et al., 2008).

Adding a dedicated ARPN to manage the stroke patient population allowed a more in-depth review of each patient's case. This aided us in improving the STK1 CPG and the continuation of high levels of provider adherence. Although the other STK measures were not statistically different, provider adherence remained high post APRN implementation.

Length of Stay

The positive findings related to length of stay (LOS) and ICU recidivism suggest the added value of implementing an APRN care model to service lines. These findings help support

that APRNs can produce cost savings and improved patient outcomes. Both measures are essential for success in today's highly competitive and rigorous healthcare market.

In the post APRN implementation group LOS was decreased by two days. Both groups were compared for likeness and were not found to be statistically different. Groups were similar in demographic makeup as well as acuity. Other studies have found that APRN implementation can reduce LOS in neuroscience intensive care (Russell, VorderBruegge, & Burns, 2002), cardiovascular surgical (Meyer & Miers, 2005), and trauma patients (Collins et al., 2014). In the pre APRN group average LOS was five days and post APRN implementation group LOS was decreased to three days. The cost savings associated for an overall two day decreased LOS for the APRN group for the studied six-month timeframe is $628,056.00.

ICU Recidivism

The cost and mortality rates associated with patients requiring ICU admissions are much more higher than admissions to general/TCU floors (Russell, 2012). In the current study, post APRN group ICU recidivism was decreased by 4.5%. This is important as "patients readmitted to the ICU have much higher mortality rates (20.7%) than first-time ICU admission (3.7%)" (Russell et al., 2002, p. 907). Recidivism to the ICU can have a directly negative impact on patient outcomes and a hospital's quality of care measurements. Having a dedicated stroke APRN care model leads to improvements in continuity of care and collaboration with the neurologist. Other studies have found that APRN implementation can reduce length of stay in the ICU (Russell et al., 2002), but no studies were found that had reviewed recidivism rates among patients. This model allows for more coverage and monitoring, and leads to enhanced knowledge of patient's readiness to transfer and improved clinical coverage.

Readmission Rates

Readmission rates are measured nationally for acute care hospitals, as they are an indicator of how well the hospital met the patient's needs during admission. This is a measure of service use and patient outcome. When a patient is readmitted between seven and 30 days the hospital loses their reimbursement for that inpatient stay.

Readmission rates for both groups were nearly identical and no statistical significance was found between the two groups. Patients in the post APRN group had a significantly shorter LOS while not compromising readmission rates or mortality rates. Similar findings have been documented among trauma (Morris et al., 2012), acute care medical (Cowen, Shapiro, & Hays, 2006), and cardiac surgical patients (David, Britting, & Dalton, 2015).

Discharge Disposition

Developing a stroke can be debilitating medical condition, thus, it is crucial to measure patient outcomes. Discharge disposition is commonly used as an outcome measure for stroke patients. Many factors affect where a patient is discharged to, such as functional status, advanced age, and social situation. The stroke patient population is unique in that there are tools that measure disability status, such as the Modified Rankin Scale (mRS) and the National Institute of Health Stroke Scale (NIHSS), which measures prognosis and acuity. Unfortunately in the 2012 data collection timeframe these were not mandatory for documentation. These measures were only documented on the post APRN group; as such this information was unable to be obtained and could not be compared between groups.

This study demonstrated that the APRN group discharged 3.7% more patients home or with home health than the pre APRN group. As it is the goal of health care providers to return patients to their previous state of health, this finding supports the improved patient outcomes in

the post APRN group. The addition of the APRN designated an expert to focus on quality and cost efficient care for the NBH stroke patient population.

The pre APRN group had a higher usage of SNF/rehab centers as well as inpatient deaths. As stroke patients' degree of disability and deficits vary greatly, a number of patients are going to require outpatient therapy. Being discharged to an SNF/rehab center is an expected finding for both groups. The inpatient mortality rate was higher in the pre APRN group and given the like populations this demonstrates poorer patient outcomes.

It is notable that the post APRN group had an increased usage of hospice services. This can be explained by the national focus on palliative care and the dying with dignity movement. A higher referral to hospice service improves patient outcomes by increasing pain control, decreasing depression, and improving patient family satisfaction (Meier, 2011). Although the outcome of hospice is death, research has shown that patients in hospice care have improved patient-centered outcomes.

Satisfaction Scores

Though the patient satisfaction response rates were low for this study, in the responses received the patients overall were very satisfied for both groups. A limiting factor of measuring the patient satisfaction specifically towards the APRN remains the fact that the "provider" verbiage in the survey only mentions "nurses" and "doctors." This verbiage can be confusing to patients and makes a true comparison difficult. Considering the low response rate and the fact that the survey was voluntary, a true measure of patient satisfaction is difficult to determine.

Impacting satisfaction rates affects all areas of healthcare, from experiences and referrals to reimbursement and retention. Evidence has shown that NPs are a trusted and valued part of the healthcare team. A study by McDonnell et al. (2014) demonstrates that the advanced nurse

practitioner (ANP) in an acute hospital setting impacted the patients by: the ANP's ability to holistically assess and understand patient perspective, improve continuity of care, improve patient provider communication, and consideration of patient dignity. Nursing satisfaction was to be studied as well, but the requested nursing satisfaction surveys were held in the odd years, and thus omitted from the study.

Limitations

Several limitations were identified in the design of this study. The data were collected from one establishment limiting the generalization of the study. Because this study was performed retrospectively, there was no way to verify reported results. If information was entered into the electronic medical record incorrectly, results could be inaccurate, distorting the outcomes of either group. Due to the nature of the study and implementation of the APRN data, collection dates could not be altered, and in 2012 certain variables were unable to be abstracted. Determining acuity of the two groups was limited, as the admission NIHSS scores were not a required documentation component in 2012. It is of note that in 2014 NBH was working towards achieving their comprehensive stroke certification (CSC) and a system wide initiative was implemented to send the complex neurology/stroke cases to NBH. They achieved the CSC status in 2015. Although all of the patients were analyzed and not randomly selected, the sample size for certain variables (CPGs, recidivism, readmissions, and patient satisfaction) remained small. A smaller sample size can make it difficult to find a statistical difference between data sets.

Another limitation of this study is that direct hospital costs were not evaluated. Cost analysis was an estimated cost savings as direct costs were not included in the study proposal. The estimated cost savings was determined using an average. The actual cost savings for the stroke patient population at NBH may vary.

The patient satisfaction self-completed surveys have a number of limitations. The main limitation often seen with surveys is that not all respondents' complete the survey. Responder bias is another limitation of voluntary self-report surveys. The verbiage used for questions pertaining to providers asks the patients about their experience with their "doctors." The HCHAP survey used did not mention nurse practitioners as providers.

Recommendations for future studies

Recommendations for future studies include further investigations of other APRN service lines to better capture the impact of different APRN roles. These types of studies are critical to show that APRNs lead the way for quality care, and can have a positive impact for the patients and hospitals. This study focused on the CNS role; a study of the nurse practitioner, midwife, and certified nurse anesthetist could provide more information on innovative ways to bridge the growing provider gap. A larger multi-facility comparison would help increase sample size and generalization. Investigating causes that affect LOS reduction such: as decreased ventilator days, decreased infectious disease consults, decreased use of IV antibiotics, and decreased hospital acquired infections would allow for a more in-depth representation of the APRNs impact. The need to clearly define acuity and direct cost savings in a future study are of great importance. Amending the verbiage in the patient satisfaction surveys to better portray the providers the patients interact with can better portray satisfaction of the APRN. This can also impact the overall perception and acceptance of the APRN role in the view of the public. Identifying specific nurse practitioner interventions to study such as ordering interventions, consulting, discharging, and performing skills can demonstrate an even greater impact on patient care.

Conclusion

The goal of this study was to demonstrate the impact of an APRN care model on CPG adherence, service use, patient outcomes and satisfaction. In six months the APRN care model impacted the stroke patients by significantly reducing LOS and ICU recidivism, resulting in a cost savings of approximately $628,056.00. There was a decrease in inpatient mortality and an increase in discharges to home improving patient outcomes. Clinical and financial outcomes were improved significantly by implementing an APRN care model. In a healthcare environment where quality and cost efficient care is paramount, the APRN care model is effective in achieving these initiatives. Adding an APRN to the team sets the standard for quality patient care and reducing hospital-associated costs. This study demonstrates that the APRN is an integral member of the healthcare team and an effective component to bridging patient provider access.

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Table 1

Inclusion Criteria of Stroke ICD-9 Codes

ICD-9 Codes	Diagnosis Definition
430	Subarachnoid hemorrhage
431	Intracerebral hemorrhage
433.11	Carotid artery occlusion with stroke
433.21	Occlusion and stenosis of vertebral artery with cerebral infarction
434.01	Cerebral thrombosis with cerebral infarction
434.11	Cerebral embolism with cerebral infarct
434.91	Unspecified cerebral artery occlusion

Table 2

List of Variables per Category

Category	Variables/Measures
Demographic Variables	
Age	Age of participants in years
Ethnicity	African American/Black, Caucasian/White, Other
Co-morbidity	CHF, COPD, HTN, DM, HLD, CAD
Sex	Male, Female
Outcome Variables	
CPG Adherence	STK1: Venous Thromboembolism (VTE) prophylaxis STK2: Discharged on antithrombotic STK3: Discharged on anticoagulant for Atrial fibrillation (AFIB) STK 4: Tissue Plasminogen Activator (TPA) STK5: Antithrombotic by the end of day 2 STK 6: Discharged on statin STK 8: Handoff Education STK 10: Rehab Evaluation
Service use	Length of stay; recidivism to the ICU; readmission (7 and 30 day)
Patient Outcomes	Discharge Disposition- Home/home health, Skilled nursing facility/rehab, decreased, hospice, other
Satisfaction Variables	
Patient Satisfaction	Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey -32 item questionnaire-refer to Appendix for a copy of the questions asked in the survey
Notes: Clinical Practice Guideline (CPG), National stroke measure (STK), Congestive Heart Failure (CHF), Chronic obstructive pulmonary disease (COPD), Hypertension (HTN), Diabetes Mellitus (DM), Hyperlipidemia (HLD), Coronary Artery Disease (CAD)	

Table 3

Demographic Characteristics by Group

Characteristic	APRN Care model Recipient		P
	No (n = 145)	Yes (n = 202)	
	n (%)	n (%)	
Age, years Mean (SD)	*68 (14.5)*	*68 (16.9)*	.89
Sex			
Male	*62 (42.8%)*	97 (48.0%)	.33
Female	*83 (57.2%)*	105 (52.0%)	
Race			
African American	12 (8.3%)	16 (7.9%)	.27
Caucasian	131 (90.3%)	177 (87.6%)	
Other	2 (1.4%)	9 (4.5%)	
Diagnosis			
Subarachnoid hemorrhage	25 (17.2%)	19 (9.4%)	.10
Intracerebral hemorrhage	21 (14.5%)	32 (15.8%)	
Carotid artery occlusion with stroke	11 ((7.6%)	10 (5.0%)	
Occlusion and stenosis of vertebral artery with cerebral infarction	1 (0.7%)	1 (0.5%)	
Cerebral thrombosis with cerebral infarction	6 (4.1%)	4 (2.0%)	
Cerebral embolism with cerebral infarct	16 (11.0%)	18 (8.9%)	
Unspecified cerebral artery occlusion	65 (44.8%)	118 (58.4%)	
Notes: Standard deviation (SD)			

Table 4

Individual Comorbidities and Comorbidity Burden

	APRN Care model Recipient		
	No (n = 145)	Yes (n = 202)	
Individual Comorbidity	*n (%)*	*n (%)*	*P*
Congestive Heart Failure			
Yes	4 (2.8%)	14 (6.9 %)	.08
No	141 (97.2%)	188 (93.1%)	
COPD			
Yes	20 (13.8%)	27 (13.4%)	.90
No	125 (86.2%)	175 (86.6%)	
HTN			
Yes	111 (76.6%)	132 (65.3%)	.02
No	34 (23.4%)	70 (34.7%)	
DM			
Yes	38 (26.3%)	59 (29.2%)	.54
No	107 (73.8%)	143 (70.8%)	
CAD			
Yes	28 (19.3%)	62 (30.7%)	.01
No	117 (80.7%)	140 (69.3%)	
HLD			
Yes	86 (59.3%)	112 (55.4%)	.47
No	59 (40.7%)	90 (44.6%)	
Comorbidity Burden, (sum of individual comorbidities)	*n (%)*	*n (%)*	*P*
0	*18 (12.4%)*	*26 (12.9%)*	
1	29 (20.0%)	48 (23.8%)	*.82*
2	50 (34.5%)	61 (30.2%)	
3	37 (25.5%)	41 (20.3%)	
4	8 (5.5%)	19 (9.4%)	
5	3 (2.1 %)	5 (2.5%)	
6	0 (0%)	2 (1.0%)	
Notes: Clinical Practice Guideline (CPG), National stroke measure (STK), Congestive Heart Failure (CHF), Chronic obstructive pulmonary disease (COPD), Hypertension (HTN), Diabetes Mellitus (DM), Hyperlipidemia (HLD), Coronary Artery Disease (CAD)			

Table 5

Comparison of service use before and after implementation of an APRN

Service Use	APRN Care model Recipient				
	No (*n=145*)	Yes (*n=202*)	P
LOS, *Median # of days (IQR)*	5 days (3-8)	3 days (2-5.25)	<.001
	No (*n=145*)	Yes (*n=202*)	P
Service Use	*n(%)*	*n(%)*	
Recidivism to ICU during admission			
Yes	8 (5.5%)	2 (1.0%)	.01
No	137 (94.5%)	200 (99.0%)	
Readmission 7-day			
Yes	6 (5.0%)	10 (6.0%)	.64
No	124 (95.0%)	162 (94.0%)	
Readmission 30-day			
Yes	18 (14.0%)	24 (14.0%)	>.99
No	112 (86.0%)	148 (86.0%)	
Notes: Length of stay (LOS), Standard Deviation (SD), Intensive care unit (ICU)			
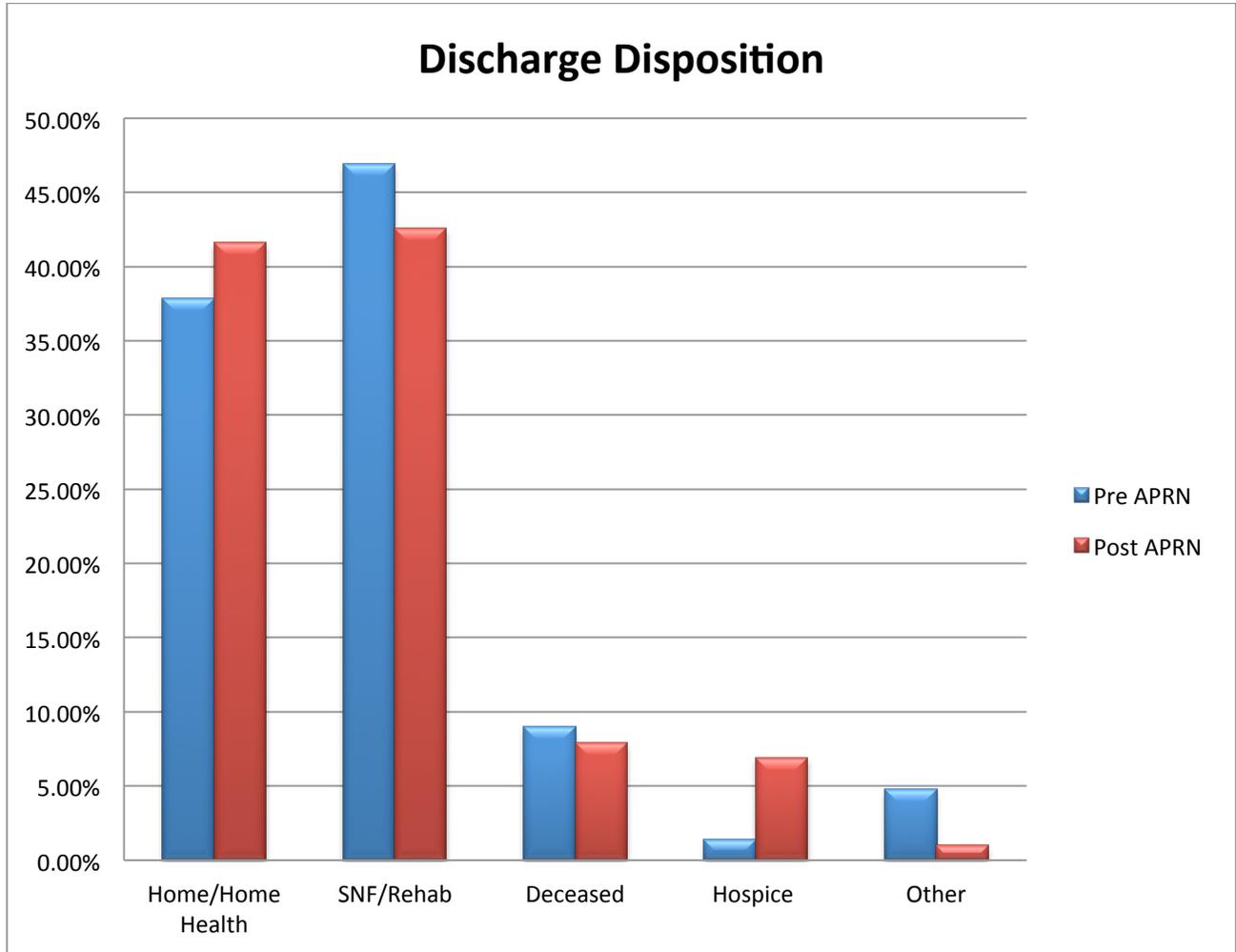
Figure 1. Comparison of patient outcomes before and after implementation of an APRN

Appendix

Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) sample survey

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HCAHPS Survey
SURVEY INSTRUCTIONS

♦ _You should only fill out this survey if you were the patient during the hospital stay named in the cover letter. Do not fill out this survey if you were not the patient.

♦ _Answer all the questions by checking the box to the left of your answer.

♦ _You are sometimes told to skip over some questions in this survey. When this happens you will see an arrow with a note that tells you what question to answer next, like this:

☐ ⚥Yes
☑ ⚥No ➔ ⚥*If No, Go to Question 1*

You may notice a number on the survey. This number is used to let us know if you returned your survey so we don't have to send you reminders.

Please note: Questions 1-25 in this survey are part of a national initiative to measure the quality of care in hospitals. OMB #0938-0981

Please answer the questions in this survey about your stay at the hospital named on the cover letter. Do not include any other hospital stays in your answers.
YOUR CARE FROM NURSES

1. During this hospital stay, how often did nurses treat you with courtesy and respect?
1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

2. During this hospital stay, how often did nurses listen carefully to you?
1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

3. During this hospital stay, how often did nurses explain things in a way you could understand?
1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

4. During this hospital stay, after you pressed the call button, how often did you get help as soon as you wanted it?
1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always
9☐ I never pressed the call

YOUR CARE FROM DOCTORS
5. During this hospital stay, how often did doctors treat you with courtesy and respect?
1□ Never
2□ Sometimes
3□ Usually
4□ Always

6. During this hospital stay, how often did doctors listen carefully to you?
1□ Never
2□ Sometimes
3□ Usually
4□ Always

7. During this hospital stay, how often did doctors explain things in a way you could understand?
1□ Never
2□ Sometimes
3□ Usually
4□ Always

THE HOSPITAL ENVIRONMENT
8. During this hospital stay, how often were your room and bathroom kept clean?
1□ Never
2□ Sometimes
3□ Usually
4□ Always
9. During this hospital stay, how often was the area around your room quiet at night?
1□ Never
2□ Sometimes
3□ Usually

4□ Always

YOUR EXPERIENCES IN THIS HOSPITAL
10. During this hospital stay, did you need help from nurses or other hospital staff in getting to the bathroom or in using a bedpan?
1□ Yes
2□ No➔ ☿**If No, Go to Question 12**

11. How often did you get help in getting to the bathroom or in using a bedpan as soon as you wanted?
1□ Never
2□ Sometimes
3□ Usually
4□ Always

12. During this hospital stay, did you need medicine for pain?
1□ Yes
2□ No ➔ ☿**If No, Go to Question 15**

13. During this hospital stay, how often was your pain well controlled?
1□ Never
2□ Sometimes
3□ Usually
4□ Always

14. During this hospital stay, how often did the hospital staff do everything they could to help you with your pain?
1□ Never
2□ Sometimes
3□ Usually
4□ Always

15. During this hospital stay, were you given any medicine that you had not taken before?
1☐ Yes
2☐ No ➜ ☿**If No, Go to Question 18**

16. Before giving you any new medicine, how often did hospital staff tell you what the medicine was for?
1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

17. Before giving you any new medicine, how often did hospital staff describe possible side effects in a way you could understand?
1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

WHEN YOU LEFT THE HOSPITAL
18. After you left the hospital, did you go directly to your own home, to someone else's home, or to another health facility?
1☐ Own home
2☐ Someone else's home
3☐ Another health facility ➜ ☿**If Another, Go to Question 21**

19. During this hospital stay, did doctors, nurses or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?
1☐ Yes
2☐ No

20. During this hospital stay, did you get information in writing about what symptoms or health problems to look out for after you left the hospital?
1☐ Yes
2☐ No

OVERALL RATING OF HOSPITAL
Please answer the following questions about your stay at the hospital named on the cover letter. Do not include any other hospital stays in your answers.
21. Using any number from 0 to 10, where 0 is the worst hospital possible and 10 is the best hospital possible, what number would you use to rate this hospital during your stay?
0☐ 0 Worst hospital possible
1☐ 1
2☐ 2
3☐ 3
4☐ 4
5☐ 5
6☐ 6
7☐ 7
8☐ 8
9☐ 9
10☐ 10 Best hospital possible

22. Would you recommend this hospital to your friends and family?
1☐ Definitely no
2☐ Probably no
3☐ Probably yes
4☐ Definitely yes

UNDERSTANDING YOUR CARE WHEN YOU LEFT THE HOSPITAL
23. During this hospital stay, staff took my preferences and those of my family or caregiver into account in deciding what my health care needs would be when I left.
1☐ Strongly disagree
2☐ Disagree
3☐ Agree
4☐ Strongly agree

24. When I left the hospital, I had a good understanding of the things I was responsible for in managing my health.
1☐ Strongly disagree
2☐ Disagree
3☐ Agree
4☐ Strongly agree

25. When I left the hospital, I clearly understood the purpose for taking each of my medications.
1☐ Strongly disagree
2☐ Disagree
3☐ Agree
4☐ Strongly agree
5☐ I was not given any medication when I left the hospital

ABOUT YOU
There are only a few remaining items left.

26. During this hospital stay, were you admitted to this hospital through the Emergency Room?
1☐ Yes
2☐ No

27. In general, how would you rate your overall health?
1☐ Excellent
2☐ Very good
3☐ Good
4☐ Fair
5☐ Poor

28. In general, how would you rate your overall mental or emotional health?
1☐ Excellent
2☐ Very good
3☐ Good
4☐ Fair
5☐ Poor
29. What is the highest grade or level of school that you have completed?
1☐ 8th grade or less
2☐ Some high school, but did not graduate
3☐ High school graduate or GED
4☐ Some college or 2-year degree
5☐ 4-year college graduate
6☐ More than 4-year college degree

30. Are you of Spanish, Hispanic or Latino origin or descent?
1☐   No, not Spanish/Hispanic/Latino
2☐   Yes, Puerto Rican
3☐   Yes, Mexican, Mexican American, Chicano
4☐   Yes, Cuban
5☐   Yes, other Spanish/Hispanic/Latino

31. What is your race? Please choose one or more.
1☐   White
2☐   Black or African American
3☐   Asian
4☐   Native Hawaiian or other Pacific Islander
5☐   American Indian or Alaska Native

32. What language do you mainly speak at home?
1☐   English
2☐   Spanish
3☐   Chinese
4☐   Russian
5☐   Vietnamese
6☐   Some other language (please print): _____
THANK YOU
Please return the completed survey in the postage-paid envelope.