

Implementation of an Advanced Practice Registered Nurse–Led Clinic to Improve Follow-up Care for Post–Ischemic Stroke Patients

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ABSTRACT

BACKGROUND: Ischemic stroke continues to be a leading cause of serious disability within the United States, affecting 795 000 people annually. Approximately 12% to 21% of post–ischemic stroke patients will be readmitted to the hospital within 30 days of discharge. Studies suggest that implementation of a follow-up appointment within 7 to 14 days of discharge improves 30-day readmission rates; however, implementation of these guidelines is uncommon, and follow-up visits within the recommended window are not often achieved. The purpose of this project was to evaluate the impact of an advanced practice registered nurse (APRN)-led stroke clinic on follow-up care for post–ischemic stroke patients. The aims were to improve time to follow-up visit and reduce 30-day unplanned readmissions. **METHODS:** A pre/post intervention design was used to evaluate the impact of a process to access the APRN-led stroke clinic. The intervention included a scheduling process redesign, and subsequent APRN and scheduler education. **RESULTS:** The time to clinic follow-up preintervention averaged 116.9 days, which significantly reduced to 33.6 days post intervention, $P = .0001$. Unplanned readmissions within 30 days declined from 11.5% to 9.9%; however, it was not statistically significant, $P = .149$. Age was not statistically different between preintervention and postintervention groups, $P = .092$, and other demographics were similar between the groups. **CONCLUSION:** An APRN-led clinic can improve follow-up care and may reduce unplanned 30-day readmissions for post–ischemic stroke patients. Further work is needed to determine the impact of alternative approaches such as telehealth.

Every year, approximately 795 000 Americans are affected by a stroke, and nearly 25% of those are recurrent attacks.¹ Stroke continues to be a leading cause of serious and long-term disability in the United States, with an estimated annual cost of \$53 billion dollars.^{1,2} Approximately 12% to 21% of post–ischemic stroke patients will be readmitted to the hospital within 30 days of discharge.^{3–5} Studies have found that timely follow-up after discharge helps to improve 30-day readmission rates.^{6–8} Given the associated cost and frequency of recurrent stroke, it is crucial to implement evidence-based interventions for improving access to care and decreasing readmission rates.

Background

Studies have shown variation in 30-day readmission, with some noting that 30-day readmissions for post–ischemic stroke patients can be as high as 21%.^{4,5,9,10} Chiou and Lang⁹ found that 15.48% of stroke patients were readmitted to the hospital within 30 days of discharge; 9.84% of these readmissions were possibly preventable. Furthermore, Vahidy et al⁴ found that approximately 12.9% of unplanned readmissions in stroke patients were potentially preventable. Recurrent stroke or transient ischemic attacks were the most prevalent reason found for readmission, with rates as high as 34.8%.^{3,11,12}

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Timeliness of follow-up clinic visits after discharge from the hospital has been shown to decrease readmission rates in multiple studies.^{6–8} Terman et al⁷ found reduced readmission rates when post-ischemic stroke patients had a primary care follow-up visit within 4 to 13 days after discharge. Riverin et al¹³ found that readmission rates were reduced in elderly and chronically ill adults if their follow-up visit was within 10 days of hospital discharge. Condon and colleagues¹⁴ showed that the optimal timing of discharge follow-up for patients recently given a diagnosis of stroke was 7 to 14 days after hospital discharge. Leppert et al⁶ recommended follow-up visits occur within 7 days of hospital discharge to reduce readmission rates, because most recurrent strokes occur within the first week. Despite compelling evidence for early follow-up for discharged poststroke patients, the adoption into current practice is poor. The average time for follow-up clinic visits for our institution's post-ischemic stroke patients was 116 days after discharge before the intervention.

Advanced practice registered nurses (APRNs) who are able to care for stroke patients in inpatient and outpatient settings are uniquely positioned to transition the patient and maintain continuity of care within this timeframe.^{8,15–17} McClain and Chance⁸ found that readmission rates were significantly lower in patients who had a follow-up visit at a transitional stroke clinic led by APRNs, compared with those who did not attend the clinic (1.5% vs 13.4%, $P = .003$). Similarly, an integrative review by Mora et al¹⁵ found that readmission rates were decreased when APRN care models were implemented. In addition, this integrative review found that APRN-led clinics led to improved health outcomes, increased patient satisfaction, decreased resource use, and decreased use of healthcare services. More recently, Hermosura¹⁶ examined the effect of telehealth visits on stroke readmissions on patients seen within 10 days of discharge and found a reduction in 30-day readmissions.

The purpose of this quality improvement (QI) project was to evaluate the impact that an APRN-led stroke clinic has on post-ischemic stroke patients' timely access to follow-up care. The primary aim was to decrease the time between hospital discharge to outpatient clinic follow-up. A secondary aim was to decrease the 30-day unplanned readmission rates.

Methods

A preintervention/postintervention design was used for this QI project. The project took place on an inpatient stroke unit at a large private comprehensive stroke center in the Middle Atlantic region of the United States. Participants were included if they had a diagnosis of ischemic stroke, were older than

Time to follow-up was reduced from 117 days to 34 days.

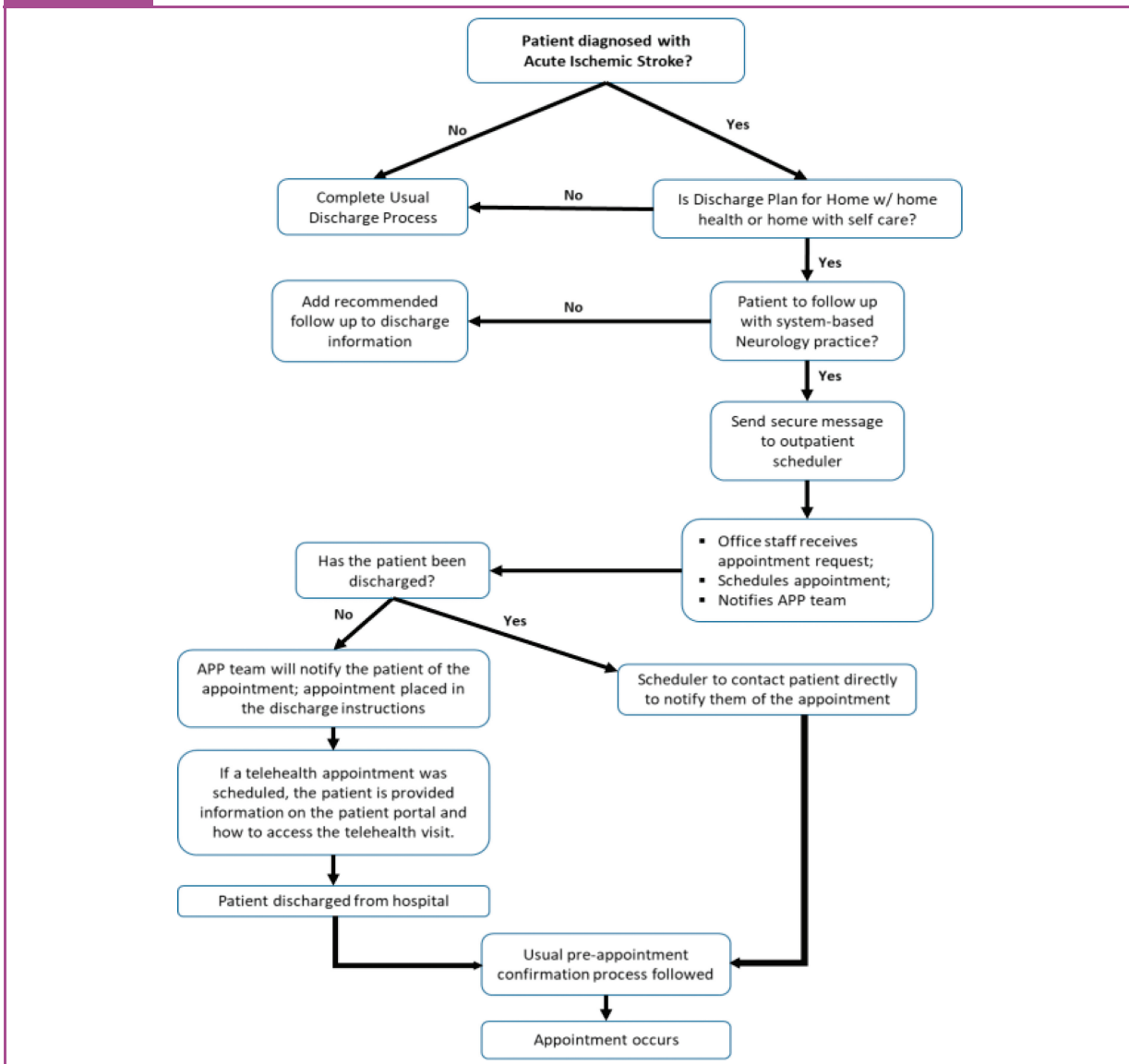
18 years, had a discharge disposition to home with self-care or home with home health, and planned follow-up with the health system neurology practice after discharge. Patients were excluded if they had a diagnosis other than ischemic stroke or were discharged to a subacute or inpatient rehabilitation, hospice, or other healthcare facility.

First, a multidisciplinary team was formed, including APRNs, a physician assistant (PA), vascular neurology physicians, outpatient schedulers, system-wide leaders, and the Director of Advanced Practice. The outpatient schedulers were included in the development of the process as key stakeholders, because their knowledge on the best way to obtain an appointment was valuable. The team developed a comprehensive algorithm providing guidance for patients to obtain timely follow-up clinic appointments after discharge from the hospital (Fig 1). The inpatient and outpatient APRNs, PAs, and outpatient schedulers were educated on the updated process using teach-back, a standardized educational process.

The APRN postdischarge clinic process (see Fig 1) was implemented on August 1, 2021. The first step in the process was to identify patients with an acute ischemic stroke who had a disposition plan for discharge to home with either self-care or home health services. If patients were identified to be discharged home, the inpatient APRNs or PAs would send a secure message text to the outpatient scheduler requesting that a follow-up appointment in the outpatient APRN-led clinic be scheduled within 7 to 14 days after discharge (or as soon as possible). The outpatient schedulers created an appointment date, time, and location (including a note whether the appointment was in-person or telehealth), and the provider with whom the patient was scheduled. The inpatient APRN or PA would then enter the appointment information into the patient's discharge instructions and communicate the details with the patient. If the patient had been discharged from the hospital before the follow-up appointment was finalized, the outpatient schedulers would contact the patient directly with the appointment information. Closed-loop communication was used by the team via secure messaging to acknowledge the appointment was obtained and confirmed.

For the follow-up clinic visit, patients were evaluated by an APRN. Patients completed a standardized depression screening and provided information regarding

FIGURE 1 Algorithm for follow-up clinic visits for stroke patients discharged from the hospital. full color online



any symptoms they may have experienced. The APRN also calculated a modified Rankin score and National Institutes of Health stroke score. During the clinic visit, the APRN focused on blood pressure measurement, addressed personalized risk factor goals, identified whether further stroke workup was indicated (eg, need for a cardiac monitor), and discussed findings from the patient's depression screen with interventions provided, if needed. The APRN provided education on the patient's personal risk factors and signs/symptoms of a stroke. If needed, the APRN would schedule a follow-up appointment for the patient with a neurologist.

The primary aim of this QI project was to improve the time to follow-up clinic visits after hospital discharge for ischemic stroke patients to within a 7- to

14-day postdischarge window. The secondary aim was to decrease the 30-day unplanned readmission rates. An unplanned readmission was defined as a separate unplanned visit to the hospital or emergency department and did not include planned readmissions for additional procedures.

All data were collected via a retrospective chart review. Demographic data were collected including sex, age, ethnicity, and race. Baseline (preintervention) time to appointment data was obtained from patient admissions that met inclusion criteria between January 1, 2018, and June 30, 2018; postintervention time to appointment data was obtained on patients who met inclusion criteria between August 1, 2021, and October 31, 2021. The follow-up appointment date was calculated if the appointment was completed

within 1 year of discharge for the preintervention group and calculated for the postintervention group if the appointment occurred within 3 months after the date of discharge. The 30-day readmission data were obtained from the retrospective chart review on patients discharged within the same pre/post timeframes.

Analysis of the data was completed using SPSS. To describe the study sample, descriptive statistics included means and standard deviations. An independent *t* test was used to compare the preintervention and postintervention age. The remainder of the demographics (sex, race, ethnicity) and the analysis of preintervention and postintervention groups (time to appointment and 30-day readmission rates) were compared using χ^2 . A *P* value < .05 was considered significant for all statistical tests.

Results

A total of 131 patients met inclusion criteria in the preintervention group, with 71 in the postintervention group. The mean age in the preintervention group was 67.85 years; in the postintervention group, the mean age was 64.49 years (*P* = .092; equal variances not assumed). Patient demographics were similar between the groups; most patients were non-Hispanic White, with approximately equal distribution between men and women in both groups. Table 1 includes a comprehensive overview of demographic data.

Only those patients who completed an appointment were included in the analysis for time to clinic follow-up; as such, 57 patients were included in the preintervention group and 31 in the postintervention group. The time to clinic follow-up visit preintervention (mean [SD]) was 116.9 (42.4) days and postintervention was 33.6 (30.0) days (*P* = .0001).

For unplanned readmission, the preintervention group had 15 patients (11.5%) readmitted within 30 days of discharge; in the postintervention group, 7 patients (9.9%) were readmitted within 30 days of discharge. The reduction in the number of unplanned readmissions from preintervention to postintervention was not significant (*P* = .149).

Discussion

Implementing an APRN-led stroke discharge clinic was associated with a significant reduction in the time to follow-up clinic visits; however, we did not obtain the goal of clinic visits being within 7 to 14 days after discharge. Similar to previous studies,^{8,15-17} the project implemented an APRN-led clinic for patients to be evaluated in a timelier manner after being discharged from the hospital for acute stroke. Our findings differ from McClain and Chance⁸ who did find a significant reduction in readmission rates after implementing an APRN-led clinic. We encountered

TABLE 1. Demographic Characteristics of Groups

Demographic	Pre (n = 131)	Post (n = 71)	<i>P</i>
Age, mean (SD), y	67.85 (13.40)	64.49 (13.50)	.092
Sex, n (%)			.883
Male	69 (52.7)	36 (50.7)	
Female	62 (47.3)	35 (49.3)	
Ethnicity, n (%)			.698
Non-Hispanic	123 (93.9)	66 (93)	
Hispanic	5 (3.8)	2 (2.8)	
Other	3 (2.3)	3 (4.2)	
Race, n (%)			.637
White	84 (64.1)	42 (59.2)	
Black	39 (29.8)	24 (33.8)	
Asian	4 (3.1)	4 (5.6)	
Other	4 (3.1)	1 (1.4)	

specific challenges that were different from previous studies because of the COVID-19 pandemic, which caused changes in access and a quick shift to telehealth visits. The pandemic also created changes to the overall inpatient populations; for example, the pandemic altered the ability to cohort acute stroke patients because of increased admissions for COVID-19, in turn decreasing the total number of patients on the unit where the project was implemented.

Whereas we did not find a significant reduction in readmission rates, APRNs can provide valuable support and resources to poststroke patients after discharge. A literature review by Magwood et al¹⁸ found that community-based interventions provided by nurses can improve poststroke service utilization, including reduced emergency department visits and 30-day readmissions. Rath et al¹⁹ conducted a qualitative study of stroke survivors and caregivers, finding multiple concerns regarding a lack of follow-up after hospitalization and dissatisfaction with their post-intensive care unit care. Advanced practice registered nurse-led stroke follow-up clinics may help alleviate these types of concerns and improve patient outcomes.^{19,20}

Although existing literature suggests the goal of 7 to 14 days for follow-up,¹⁴⁻¹⁶ other studies suggest that follow-up within 30 days can also improve readmission rate.^{7,21} One study found that follow-up visits with primary care within 30 days was associated with reduction in hospital readmission.⁷ More specifically, Allen et al²¹ suggested that neurology follow-up at any point after admission for ischemic stroke may improve readmissions at 30 days post discharge than those who never followed up.

Although we did not see a significant reduction in unplanned 30-day readmission rates, this was similar to other studies.^{22–24} Our findings were comparable with those summarized in a literature review by Puhr and Thompson,²³ which found stroke discharge clinics did not significantly reduce readmission rates among 11 studies. The authors concluded that studies of transitional care models for patients with ischemic stroke may be confounded by the growing implementation of inpatient stroke units providing comprehensive care, which has demonstrated improved outcomes when compared with outpatient models.²³ Qian et al²⁵ also found no effect on readmission rates when a follow-up phone call at 7 days was implemented as part of a transitional nursing care model. Finally, Kao et al²⁴ similarly did not find a reduction in stroke readmission rates after implementation of an APRN-led stroke follow-up clinic.

More recently, Leppert et al⁶ reported improved 30-day readmission rates among patients with acute ischemic stroke seen by primary care providers within 30 days; however, patients in this retrospective review who were discharged to home with neurology follow-up did not demonstrate improved readmission rates. Deutschbein et al²⁶ followed patients after stroke for 1 year and found that follow-up with outpatient neurology at any point in time resulted in less frequent readmissions within the year after admission for acute stroke. Whereas this project did not find a significant reduction in 30-day readmission rates after implementing an APRN-led clinic, there is importance in identifying ways to improve access to stroke care and improve transitions of care in a meaningful way.

Limitations

Although implementing an APRN-led clinic was associated with significant improvement in time to follow-up clinic visits, the project is limited by a single-center preintervention/postintervention design. The overall sample size for both preintervention and postintervention cohorts was small, which is a limitation for generalizability. In addition, we experienced multiple COVID-19–related challenges, including shifts in the overall hospital population and decreased ability to cohort stroke patients to a single unit. Finally, many patients who were initially scheduled within the 7 to 14-day timeframe either rescheduled, canceled, or did not show up to the appointment for unknown reasons.

Conclusion

This project found that implementation of an APRN-led clinic can improve timeliness of follow-up care and may help reduce unplanned 30-day readmissions for post-ischemic stroke patients. Healthcare systems should

consider implementing standardized processes, including closed communication between teams and clear plan for follow-up on the discharge instructions for the patient. Given that the project focused on hospital discharges to home, future interventions should focus on improving patient adherence to attending follow-up clinic visits, investigating additional ways to improve 30-day readmission rates in patients with ischemic stroke, and improving access to telehealth visits.

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