Examining The Relationship Between Stroke Severity and Readmission: Tailoring Patient and Family Education

By
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A DNP project submitted to the
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**DNP Project Approval Form**

This is to certify that **Marie Campbell** (Name of Student) successfully disseminated their project entitled:

**Examining the Relationship Between Stroke Severity and Readmission: Tailoring Patient and Family Education**

on **May 7, 2020** (Date)

DNP Project Advisor

<table>
<thead>
<tr>
<th>Committee Member 1*</th>
<th>Committee Member 2*</th>
<th>Committee Member 3*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carolyn Montgomery, PhD, ANP-C, GNP</td>
<td>Carolyn Montgomery, PhD, ANP-C, GNP</td>
<td>Carolyn Montgomery, PhD, ANP-C, GNP</td>
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*If applicable*
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Abstract

Background and Significance: Stroke is the leading cause of disability in the United States. Sequelae of stroke and common comorbid conditions put patients at risk for unplanned readmissions. Stroke readmissions at a comprehensive stroke center (CSC) in Buffalo, NY, were investigated to determine primary causes of unplanned readmissions.

Purpose, Aims, and Objectives: The purpose of this project was to explore primary causes of 90-day stroke readmissions. The project specifically focused on whether there is a relationship between modified Rankin Scale (mRS) at time of discharge and 90-day readmission.

Theoretical Framework: This project used Orem’s Self-Care Deficit Nursing Theory as a framework. Orem’s theory is particularly applicable to stroke patients, as it assists nurses in identifying the specific challenges faced by individual patients.

Methods and Design: A retrospective chart review was used to collect data on patients with unplanned readmissions within 90 days. A Kruskal-Wallis test was used to determine whether there was a relationship between functional status and readmission.

Results: The study demonstrates mRS at index discharge has a statistically significant effect on primary readmission diagnosis, $X(4)= 9.572, p= 0.048$.

Conclusion: Some reasons for 90-day readmission are more common among patients with poor functional outcomes after stroke, while others are unrelated to functional status.

Future Implications and Recommendations: Based on preliminary data, discharge education for stroke patients should be tailored to their functional status, with special consideration given to the patient’s ability to maintain his own health and wellness.

Keywords: stroke, modified Rankin Scale, readmission, functional status
The past 25 years have seen incredible advances in the treatment of stroke, leading to improved functional outcomes for patients. However, stroke is the leading preventable cause of disability in the United States (Morrison, 2018) and the fifth leading cause of death (Heron, 2018). Studies have found that up to 16% of stroke patients will be readmitted within 30 days. Of those readmissions, 50% may be avoidable (Zhong et al., 2016; Nahab et al., 2012). The Center for Medicaid and Medicare Services tracks 30-day unintended readmission rates after stroke as a measure of quality care (Poston, 2018).

**Background and Significance**

There are many potential reasons a patient may return unexpectedly to the hospital. Recurrent stroke is a frequent and often devastating cause of readmission. The index stroke can also lead to loss of independence, mobility issues, dysphagia, dysarthria, aphasia, cognitive disturbances, and urinary retention. These complications of stroke may lead to readmissions for urinary tract infection, pneumonia, deep vein thrombosis (DVT) and pulmonary embolism (PE), pressure ulcers, constipation, and falls (Benjamin et al., 2019). Many of these causes of readmission are potentially preventable.

Stroke patients and their families at the comprehensive stroke center (CSC) examined in my study receive primarily oral and written forms of education. Within 24 hours of arrival, all stroke patients receive a robust booklet outlining many key aspects of a stroke diagnosis, from descriptions of potential treatments to post-discharge resources and warning signs that require medical intervention. They also receive oral education in the form of staff communication. This communication can be both formal teaching (i.e. discharge education) and less formal discussion with nurses, therapists, and providers at the bedside. Ideally, patient and family education begins at admission and continues throughout the course of the patient’s hospitalization.
The goal of this research was to answer the following question: In adult (>18 years old) patients treated for stroke at a comprehensive stroke center (CSC) in Buffalo, NY, who are readmitted within 90 days, is there a correlation between modified Rankin Scale (mRS) at time of discharge and readmission diagnoses that can be utilized to improve patient and family education?

Although 30-day readmissions are tracked at my research site, to date there has been no thorough investigation into the causes of readmission. The stroke team currently completes 90-day follow-up with patients to assess functional outcomes using standardized tests such as the modified Rankin Scale (mRS), and does ask the patients whether they have been readmitted. However, they do not track specific causes of readmission. Understanding causes of readmission will identify potentially modifiable risk factors and ultimately improve the education patients and families receive, with a focus on their specific circumstances.

The modified Rankin Scale is a modern adaptation of the original work of Dr. John Rankin in 1957. The current adaptation, developed by Charles Warlow in the 1980s, is the most common outcome scale used in acute stroke trials and has been validated in several studies (Broderick et al., 2017). With seven levels from 0-6, 0 being the absence of symptoms and 6 being death, the scale provides a simple and straightforward way to assess disability.

Purpose and Objectives

This project explored the primary causes of 90-day readmission for post-acute stroke patients at a CSC in Buffalo, NY, with the purpose of improving patient, family, and discharge education. Project objectives included the following: 1. Establish an assessment of the relationship between severity of stroke symptoms at time of discharge and readmission diagnosis. 2. Examine the relationship between discharge disposition and readmission diagnosis.
3. Use this information to inform hospital-based caregivers and provide enhanced education to patients and families prior to discharge.

**Theoretical Framework**

This project utilized Orem’s Self-Care Deficit Nursing Theory as a framework. Orem (2001) describes three interrelated sub theories; the theory of self-care, the theory of self-care deficit, and the theory of nursing system. The theory of self-care encompasses the requirement and ability of the individual to provide for their own care. This ability is dependent on many factors, including age, health, ability to engage resources, and socio-cultural aspects. It can be further divided into three parts: universal, developmental, and health-care deviation self-care requisites. Universal self-care requisites involve critical life processes, while developmental requisites involve developmental processes. Health-care deviation self-care requisites will be most relevant to this study, as they involve adapting to and managing “conditions of illness, injury, or disease” (Orem’s Self-Care Deficit, n.d.).

The roles of the nurse in Orem’s theory are clarified in the theory of self-care deficit. Under the theory of nursing systems, the nurse and patient have delineated roles based on the patient’s abilities and the capability of the nurse to compensate and support where needed. The specific needs of the patient have been addressed, and a system is put into place in order to optimize the health and wellness of the patient. Based on the needs of the patient, the system may be wholly compensatory, partially compensatory, or supportive-educative (Orem, 2001; Orem’s Self-Care Deficit, n.d.).

Orem’s Self-Care Deficit Theory is especially appropriate for application with the stroke population. In many cases, patients who have suffered acute stroke were living independently prior to their stroke. The transition from relative health to disability is scary and frustrating for
both patients and family members. Nurses are able to use Orem’s theory to assess and guide patients through this challenging time. A standard of stroke rehabilitation is to support the patient in supporting themselves, and taking steps necessary to return the patient to as much functional independence as possible (Morrison, 2018).

Improving our understanding of the risk factors faced by recovering stroke patients is key to identifying hazards to the patient in the setting of health deviation. According to Orem (2001), nursing interventions on behalf of the patient can include “acting for and doing for others; guiding others; supporting another; providing an environment promoting personal development in relation to meet future demands; and teaching another” (Orem’s Self-Care Deficit, n.d.). Using this approach, the nurse can work with the patient and family to determine the limitations of the patient’s self-care abilities and decide where they will need continued support, and provide education and guidance to prepare patient and family for challenges they will likely face. In order to be successful, a nurse must be well versed on the trajectory of the patient’s care, both in the acute care setting and after discharge.

**Literature Review**

There have been several studies within the past five years with the objective of addressing readmission after stroke and TIA. The timelines studied are varied, however, and the patient variables addressed are numerous. A search of the literature was conducted using the following terms: “Stroke or cerebrovascular accident or CVA AND readmission AND severity.” All databases were set to obtain only articles published within the last five years, and, where available, results were limited to “English only.” PubMed, the Cochrane Database of Systematic Reviews, the Cochrane Central Register of Controlled Trials, EBSCO Host, CINAHL Plus with Full Text, and Ovid were searched using these criteria.
Initially 330 titles were reviewed, of which 46 were selected for abstract review. Ten articles were selected for review. An additional search of all databases was conducted without the term “severity.” An additional 2704 titles and 13 abstracts were reviewed, with three additional articles selected. Of the thirteen articles selected, three were discarded due to extreme specificity or limited applicability to the confines of this project. Two focused specifically on index hospitalization infections and risk of readmission, while one only studied whether early outpatient visits after index admission reduced readmissions.

The existing literature reviewed here includes seven cohort studies, one retrospective cross-sectional study, one retrospective case-control study, and one systematic review and meta-analysis. The majority of the studies examined multiple factors influencing readmissions, including patient demographics, stroke severity, comorbidities, treatment modalities, and discharge disposition. The time frame for most studies ranged between three days and five years, with the majority studying readmission rates at 30 days and one year.

Readmission Diagnoses

Eight of ten studies discussed specific reasons for readmission. Two studies found infection to be the most common cause of readmission at 30 days and one year (Hsieh et al., 2017; Leitao et al., 2016). Two cohort studies (Bjerkreim et al, 2016; Bjerkreim et al., 2019) and the systematic review by Zhong et al. (2016) found that infection was the most common cause of readmission in the first 90 days, the first year, and the first 30 days, respectively, but later readmissions were most often due to cardiovascular disease.

Lainay et al. (2015) studied readmissions in the first year after discharge and Strowd et al. (2014) studied 30-day readmissions, but both found that neurological conditions and recurrent stroke/TIA were the most common presenting diagnosis. Lainay et al. (2015) studied 519
patients from a stroke registry in Dijon, France, and found that both cardiac conditions and orthopedic/rheumatologic conditions were more frequent causes of readmission than infection. Mittal et al. (2017) conducted a 30-day readmission study from a cohort of 537 patients, and were the only authors who found that cardiovascular concerns were the most common cause of early readmission. In this study, infectious and musculoskeletal concerns were also common causes of readmission.

Although most of the studies acknowledge infection as a common or the most common cause of readmission, not all discuss the source of infection. In a Portuguese cohort study, Leitao et al. (2016) found that pulmonary infections were most common, with urinary infections following. Bjerkreim et al. (2016) found that pneumonia was the most common cause of readmission in patients with an initial diagnosis of intracranial hemorrhage. Mittal et al. (2017) found that preventable readmissions included both urinary infections and pulmonary infections.

**Readmission Risk Factors**

Statistically significant readmission risk factors were varied among the studies. Comorbidities associated with readmissions included diabetes (Bjerkreim et al., 2016), atrial fibrillation (Bjerkreim et al., 2019; Lainay et al., 2015), hypertension (Lainay et al., 2015; Mittal et al., 2017; Bjerkreim et al., 2019), a history of dementia (Mittal et al., 2017) and history of CAD or peripheral artery disease (PAD) (Zhong et al., 2016; Bjerkreim et al., 2019). Additional risk factors included age (Bjerkreim et al., 2019), early mild or absent signs of ischemia (Leitao, 2016), use of intravenous thrombolysis (tissue plasminogen activator, tPA), and marital status (Mittal et al., 2017). Not surprisingly, some authors found that length of index hospitalization (Zhong et al., 2016) and a history of frequent hospitalization prior to stroke admission (Strowd et al., 2014) were predictors of readmission. A longer index hospitalization is likely indicative of
severe stroke or subsequent hospitalizations, while frequent hospitalizations prior to the index stroke is indicative of patients with recurrent medical conditions that are not well controlled. These patients may be at high risk for hospital admission regardless of the severity of the stroke they were treated for.

**Stroke Severity and Functional Status**

The most common predictor of readmission after stroke across multiple studies was stroke severity. The National Institute of Health Stroke Scale (NIHSS), a 15-item tool that provides quantitative measurements of neurological deficits in the acute stroke setting, is a community standard and therefore a common data point across the majority of these studies. The NIHSS can be used to predict lesion size, determine appropriate treatment, and forecast patient outcomes (NIH Stroke Scale International, n.d.). Five of the studies specifically analyzed the relationship between index hospitalization NIHSS and readmission rates. Bjerkreim et al. (2016) observed trends in increasing NIHSS and increasing readmission rates, though without statistical significance, while Lainay et al. (2015), Leitao et al. (2016), Strowd et al. (2014) and meta-analysis by Zhong et al. (2016) found statistically significant correlations between the two.

Unlike the mRS, the NIHSS is not used outside of the acute treatment window. Though very predictive, it does not directly correlate with the patient’s functional status. Three of the studies examined specifically looked at mRS as a measurement of patient functional status. Bjerkreim et al. (2016) and Lainay et al. (2015) saw trends that suggested an association between mRS and readmission, but only the Bjerkreim et al. (2019) analysis of one-year versus five-year risk of hospital readmission found a statistically significant relationship.

Only one study was focused exclusively on stroke severity as a predictor of readmission. Hsieh et al. (2017) studied the relationship between one-year readmission and the Stroke
Severity Index (SSI), a seven-item scale based on claims entered into a Taiwanese insurance database. The authors found that there was a 34.1%, 44.7%, and 62.9% chance of readmission in patients with mild, moderate, and severe stroke, respectively. Furthermore, there were statistically significant trends in readmission diagnosis. Patients with moderate to severe strokes were more likely to be readmitted with infection, though during the first 30 days, patients with moderate stroke were more likely to be admitted with recurrent stroke or TIA. Patients with mild stroke were also most likely to be readmitted with stroke or TIA, regardless of timeframe.

Slocum et al. (2015) developed a tool to predict early readmission to the hospital from inpatient rehabilitation facilities in patients recovering from stroke. The authors examined 18 motor and cognitive items using the FIM instrument as a prediction of functional ability. This instrument, when combined with patient age, was a better predictor of readmission at 3, 7, and 30 days than a tool based on comorbidities and age.

**Discharge Disposition**

Another common measurement that may be indicative of functional status is discharge disposition. Patients with residual deficits will require varying levels of rehabilitation depending on their medical stability and ability to participate in therapy (Morrison, 2018). High-functioning patients may be discharged to home with outpatient rehabilitation, while those with severe disability are more likely to go to a long-term care facility. Many of the studies explored discharge disposition to some extent. Bjerkreim et al. (2016) found that discharge to a nursing home was an independent predictor of readmission within 90 days of hemorrhagic stroke. Leitao et al. saw a trend toward fewer admissions in patients discharged to home, and Lainay et al. (2015) did not find a correlation between discharge to home and readmission, but did find that patients discharged to home were more likely to be alive at one year. Bjerkreim et al. (2019) and
Strowd et al. (2014) did not find statistically significant relationship with discharge disposition, while Mittal et al. (2017) found that discharge to a nursing home was a negative predictor.

Andrews & Freburger (2015) looked specifically at the relationship between hospitalization rehabilitation intensity and risk of readmission. After adjusting for severity of stroke, they found that more intense rehabilitation led to a reduction in readmissions at both 30 and 90 days. Therapy from multiple members of the care team, such as physical therapy, occupational therapy, and speech therapy, was indicative of a more robust intensity.

**Methods and Design**

This project was a retrospective chart review of patients discharged from a comprehensive stroke center in Buffalo, NY after a diagnosis of ischemic stroke. This study was designed to support development of a robust and well-informed discharge program with the goal of educating staff, and in turn stroke survivors and their families.

Subjects included all adult patients discharged from the comprehensive stroke center between January and October 2019 with a primary diagnosis of “stroke,” who were subsequently readmitted within 90 days. Patients under the age of 18 and patients who expired during index hospitalization were excluded from the study. Patients discharged to hospice were also excluded.

The project methods and design were selected after an extensive review of the literature. Once IRB approval and a HIPAA waiver of consent approval was received, electronic medical record (EMR) data was requested through corporate decision support of the target hospital. All medical record numbers (MRN) with a discharge ICD-10 of “I63,” or “cerebral infarction,” were queried, along with admission and discharge date of any admissions within the requested time period, age, gender, and activity code. The activity code helped the researcher to determine
whether readmissions were for rehabilitation purposes or planned surgical procedures, which reduced the number of charts that ultimately needed to be reviewed.

A total of 1719 stroke admissions were reviewed, as well as readmission dates related to those admissions. After initial admission date review, 265 potential readmissions were isolated and associated charts were reviewed in the electronic medical record (EMR). A total of 196 patients met inclusion criteria after removing additional patients who were readmitted for planned procedures, died during index admission, or were discharged to hospice services. Additional relevant data, including index discharge disposition, readmission diagnosis, age and comorbidities were collected. Additional readmissions within 90 days of discharge were also noted, though only the first readmission following a stroke was included in the diagnosis data.

Modified Rankin Scale (see Appendix B) at the time of discharge is included in the information collected and recorded by the internal stroke team as part of ongoing quality improvement. mRS is either determined by the discharging provider, or, more frequently, estimated by trained reviewers within the stroke team based on data from the patient’s chart. The mRS results for all 2019 stroke discharges were queried from the Get with the Guidelines database and were correlated with the MRNs. As discussed previously, the validity of mRS in assessing post-stroke functional status has been evaluated in multiple studies, and it is considered a practice standard (Broderick et al., 2017). One additional record was removed during this step because the patient was discharged with an mRS of “6,” meaning the patient died during the index admission. The total sample size was 195 admissions.

Once collected and organized, data was analyzed using a Kruskal-Wallis H test to determine whether there is a relationship between functional status and readmission. This
allowed for an exploration of related variables and variables that may influence readmission
independent of functional status. SPSS software was used to analyze data.

Protection of Human Rights and Ethical Considerations

This study was reviewed by the University at Buffalo’s Institutional Review Board. As
this is a retrospective review of existing medical data, no additional contact with patients or
families was necessary. Medical records were reviewed in a private setting within the institution,
and compiled data was stored in a password-encrypted Excel spreadsheet. No identifiable patient
information was used in this study.

Results

Demographics

For the period of January to October 2019, 1136 stroke admissions were discharged from
the CSC. This does not include stroke patients who died during their initial admission, or those
who were discharged to hospice. Of those discharged, 195 (17.2%) were readmitted within 90
days, with a mean readmission time of 31.5 days and a range of 0-89 days. Of those patients who
were readmitted, 19 (9.7%) had two or more readmissions within 90 days.

The gender distribution of readmitted patients was almost identical, with 97 males (49.7)
and 98 females (50.3%) returning within 90 days. Of the 195 readmitted patients, 142 (72.8%)
were Caucasian, 48 (24.6%) were African American, four (2.1%) were Asian, and one (.5%) was
American Indian. Only three (1.5%) identified as Hispanic or Latino. Subjects ranged from 39 to
97 years of age with a mean of 71.5 and mode of 74. Three comorbidities- a prior diagnosis of
atrial fibrillation, diabetes mellitus, or coronary artery disease (CAD)- were examined. Atrial
fibrillation was most common comorbidity among readmitted patients at 32.3%, while 31.8%
had diabetes and 26.2% had been diagnosed with CAD.
Modified Rankin Scale (mRS)

The mRS at discharge data is presented in Table 1 below alongside data from the total discharged population for the same time period. The total discharge population does not include patients who did not survive initial admission or those discharged to hospice care. For those readmitted, mean mRS was 2.84 with a mode of 4, while the total population had a mean mRS of 2.4 and mode of 4. A detailed description of the modified Rankin Scale can also be found in Appendix B.

Table 1

*Modified Rankin Scale (mRS) for Patients Readmitted within 90 Days versus Population*

<table>
<thead>
<tr>
<th>mRS</th>
<th>Readmitted Patients</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent (%)</td>
</tr>
<tr>
<td>0</td>
<td>29</td>
<td>14.9</td>
</tr>
<tr>
<td>1</td>
<td>22</td>
<td>11.3</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>9.2</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>17.4</td>
</tr>
<tr>
<td>4</td>
<td>66</td>
<td>33.8</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
<td>13.3</td>
</tr>
<tr>
<td>6(\textsuperscript{b})</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>195</td>
</tr>
</tbody>
</table>

*Note.* \(\textsuperscript{a}\) Three values missing from population data set. \(\textsuperscript{b}\) Patients with an mRS of 6 (death) were not included in this study.

Readmission Diagnosis

Readmission diagnoses were originally collected via individual ICD-10. Secondary diagnosis code was also recorded where available. Codes were grouped into 21 separate groups.
based on type of readmission for ease of analysis. Table 2 below provides a breakout of types of readmission.

Table 2

*Primary and Secondary Readmission Diagnosis*

<table>
<thead>
<tr>
<th>Diagnosis Group</th>
<th>Primary Readmission Diagnosis (PRD)</th>
<th>Secondary Readmission Diagnosis (SRD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent (%)</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>72</td>
<td>36.9</td>
</tr>
<tr>
<td>Ischemic Heart Disease</td>
<td>8</td>
<td>4.1</td>
</tr>
<tr>
<td>Blood Pressure Concerns</td>
<td>5</td>
<td>2.6</td>
</tr>
<tr>
<td>Venous and Arterial Complications</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>Other Forms of Heart Disease</td>
<td>14</td>
<td>7.2</td>
</tr>
<tr>
<td>Pulmonary Conditions</td>
<td>9</td>
<td>4.6</td>
</tr>
<tr>
<td>Digestive System Conditions</td>
<td>7</td>
<td>3.6</td>
</tr>
<tr>
<td>Gastrointestinal Hemorrhage</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>Urinary Tract Infection</td>
<td>7</td>
<td>3.6</td>
</tr>
<tr>
<td>Kidney Failure and Disease</td>
<td>13</td>
<td>6.7</td>
</tr>
<tr>
<td>Convulsions</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Bone Fracture</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Complications Related to Medical</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>Procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diseases of the Nervous System</td>
<td>9</td>
<td>4.6</td>
</tr>
<tr>
<td>Endocrine, Nutritional, or Metabolic</td>
<td>6</td>
<td>3.1</td>
</tr>
<tr>
<td>Disease</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Anemia                6   3.1   0   0
Sepsis                 6   3.1   1   .5
Issues of Cognitive Function and Awareness
Abnormal Levels of Other Enzymes    1   .5   3   1.5
Malaise, Fatigue, or Headache        1   .5   4   2.1
Other (Singular Instances)          14  .5   29  14.9

Total                      195 100  159\(^a\) 100

Note. \(^a\)36 subjects did not have a secondary diagnosis.

**Analysis of the Relationship Between Discharge mRS and Readmission Diagnosis**

After reviewing available options for analyzing the given variables, the most appropriate test was determined to be a Kruskal-Wallis test. In the given data, mRS is an ordinal variable and diagnostic category is a nominal variable. The Kruskal-Wallis test is an alternative to a standard analysis of variance (ANOVA) when the data does not entirely conform to the assumptions of an ANOVA. It allows the testing of a combination of ordinal and nominal data when there is a significant number of categories in both. Table 3 demonstrates the results of a Kruskal-Wallis test comparing the mRS to the primary and secondary readmissions diagnoses.

Table 3

**Analysis of the Relationship Between mRS and Readmission Diagnosis**

<table>
<thead>
<tr>
<th></th>
<th>Primary Readmission Diagnosis</th>
<th>Secondary Readmission Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kruskal-Wallis H</td>
<td>9.572</td>
<td>2.057</td>
</tr>
</tbody>
</table>
According to the Kruskal-Wallis test, the study did demonstrate that mRS at index discharge has an effect on primary readmission diagnosis. There is not, however, a relationship between mRS at index discharge and secondary readmission diagnosis. This difference is not unexpected, as the secondary diagnosis is often inherently less significant to the patient’s reasons for returning to the hospital than the primary diagnosis.

Table 4 demonstrates the frequency of readmissions for a given diagnosis group by mRS.

Table 4

*Primary Readmission Diagnosis and mRS*

<table>
<thead>
<tr>
<th>Diagnosis Group</th>
<th>mRS</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrovascular Disease</td>
<td></td>
<td>18</td>
<td>9</td>
<td>10</td>
<td>8</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Ischemic Heart Disease</td>
<td></td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Blood Pressure Concerns</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Venous and Arterial</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Other Forms of Heart Disease</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
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<td>4</td>
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<td>3</td>
<td>6</td>
<td>2</td>
<td></td>
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<td>----</td>
<td>----</td>
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<td></td>
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<tr>
<td>Kidney Failure and Disease</td>
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<td>3</td>
<td>6</td>
<td>2</td>
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<td>Convulsions</td>
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<td>Bone Fracture</td>
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<td>1</td>
<td>0</td>
<td></td>
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<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>0</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td></td>
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<tr>
<td>Sepsis</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Issues of Cognitive Function and</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Awareness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Abnormal Levels of Other Enzymes</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
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<tr>
<td>Malaise, Fatigue, or Headache</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other (Singular Instances)</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Discharge Disposition**

Discharge disposition is examined in Table 5. Patients were divided into six groups. Subacute rehabilitation included rehabilitation at an outside facility, while hospital-based rehabilitation took place on a designated unit within the CSC. “Home with assistance” was defined as some sort of professional support, such as visiting nurses, home-based physical therapy, etc., and “home independently” meant there was no continuing professional assistance.
at home. By this definition, patients who were discharged to “home with family care” were categorized as “home independently.” Two patients (1.0%) returned to their original assisted living situation, while five (2.6%) were discharged to skilled nursing facilities for long-term care.

Table 5

Discharge Disposition

<table>
<thead>
<tr>
<th>Discharge Location</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Acute Rehabilitation</td>
<td>41</td>
<td>21.0</td>
</tr>
<tr>
<td>Hospital-Based Rehabilitation</td>
<td>46</td>
<td>23.6</td>
</tr>
<tr>
<td>Home with Assistance</td>
<td>43</td>
<td>22.1</td>
</tr>
<tr>
<td>Home Independently</td>
<td>58</td>
<td>29.7</td>
</tr>
<tr>
<td>Assisted Living</td>
<td>2</td>
<td>1.0</td>
</tr>
<tr>
<td>Skilled Nursing Facility</td>
<td>5</td>
<td>2.6</td>
</tr>
</tbody>
</table>

As a secondary objective of this study, a Kruskal-Wallis test was run to examine the relationship between discharge disposition and primary readmission diagnosis. Like with mRS, there is a statistically significant relationship between discharge disposition and readmission diagnosis. Table 6 demonstrates the results of this analysis.

Table 6

Analysis of the Relationship Between Discharge Disposition and Readmission Diagnosis

<table>
<thead>
<tr>
<th>Primary Readmission Diagnosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kruskal-Wallis H</td>
<td>17.65</td>
</tr>
<tr>
<td>df</td>
<td>5</td>
</tr>
<tr>
<td>p</td>
<td>.003</td>
</tr>
</tbody>
</table>
Table 7 demonstrates the frequency of readmissions for a given diagnosis group by discharge disposition. While this relationship is not a primary focus of this research, it may serve as a foundation for future inquiry. It is natural to assume that subjects with a higher mRS at discharge are more likely to be discharged a rehabilitation facility or with home assistance, which may account for the fact that both have a statistically significant relationship with the readmission diagnosis. However, other factors cannot be ruled out and were beyond the scope of this study.

Table 7

*Primary Readmission Diagnosis and Discharge Disposition*

<table>
<thead>
<tr>
<th>Diagnosis Group</th>
<th>Discharge Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Home Independently</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>32</td>
</tr>
<tr>
<td>Ischemic Heart Disease</td>
<td>2</td>
</tr>
<tr>
<td>Blood Pressure Concerns</td>
<td>0</td>
</tr>
<tr>
<td>Venous and Arterial</td>
<td>0</td>
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<tr>
<td>Complications</td>
<td></td>
</tr>
<tr>
<td>Other Forms of Heart Disease</td>
<td>4</td>
</tr>
<tr>
<td>Pulmonary Conditions</td>
<td>3</td>
</tr>
<tr>
<td>Digestive System Conditions</td>
<td>2</td>
</tr>
<tr>
<td>Condition</td>
<td>Count</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>1</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>0</td>
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<tr>
<td>Urinary Tract Infection</td>
<td>0</td>
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<tr>
<td>Kidney Failure and Disease</td>
<td>4</td>
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<tr>
<td>Convulsions</td>
<td>0</td>
</tr>
<tr>
<td>Bone Fracture</td>
<td>0</td>
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<tr>
<td>Complications Related to Medical Procedures</td>
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<tr>
<td>Diseases of the Nervous System</td>
<td>2</td>
</tr>
<tr>
<td>Endocrine, Nutritional, or Metabolic Disease</td>
<td>1</td>
</tr>
<tr>
<td>Anemia</td>
<td>1</td>
</tr>
<tr>
<td>Sepsis</td>
<td>0</td>
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<tr>
<td>Issues of Cognitive Function and Awareness</td>
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<tr>
<td>Abnormal Levels of Other Enzymes</td>
<td>1</td>
</tr>
<tr>
<td>Malaise, Fatigue, or Headache</td>
<td>1</td>
</tr>
<tr>
<td>Other (Singular Instances)</td>
<td>4</td>
</tr>
</tbody>
</table>
**Discussion**

Certain categories of readmission diagnosis tended to be more common among patients with higher discharge mRS. A patient with a discharge mRS of 0-2 appears to be less likely to have an unplanned readmission. They also are less likely to return to the hospital with a diagnosis of urinary tract infection (UTI), sepsis, pulmonary issues, arterial or venous complications, anemia or kidney failure and disease than a patient with a discharge mRS of 3-5. There are many reasons these trends occur. One common cause in these particular readmission groups is infection. In addition to UTI cases, the category of “pulmonary issues” includes pneumonia, pleural effusion, respiratory failure and COPD. Patients with diagnosis of sepsis are also likely related to an underlying infection. Infection was a frequently observed cause of readmission in prior studies as well (Bjerkreim et al., 2016; Bjerkreim et al., 2019; Hsieh et al., 2017; Leitao et al., 2016; Zhong et al., 2016).

Patients with significant stroke disability are more likely to have difficulty with bodily functions, including dysphagia and elimination. Difficulty swallowing increases risk of aspiration (Benjamin et al., 2019). Aspiration pneumonia was the primary diagnosis in three of the nine patients readmitted for pulmonary issues, and the secondary diagnosis of three additional patients. Patients with higher mRS scores also tend to have extended hospitalizations, and to be discharged to a facility outside of their own home. This may increase risk of urinary catheterization, sometimes for extended periods. Catheterization is known to increase risk of UTI (Centers for Disease Control [CDC], n.d.). Although catheter-associated UTI (CAUTI) is a known and closely tracked quality measure in many healthcare settings, catheterization of critically ill patients is a common practice for a variety of medically necessary or convenience reasons.
The category “venous and arterial complications” includes diseases of the arteries, arterioles and capillaries, as well as venous embolism and thrombosis. Venous embolism and thrombosis was the primary readmission diagnosis in one patient (mRS 4) and the secondary diagnosis in two other patients. Arterial complications included atherosclerosis, aneurysm, and peripheral vascular disease. “Kidney failure and disease” is a broad category that can have many different root causes. Further research into the specific cause of kidney failure diagnosis in patients recovering from stroke would be warranted to determine if and when this diagnosis may be avoidable.

Finally, an interesting result of this study was the frequency of anemia (n=6) and gastrointestinal hemorrhage (n=4) in patients recovering from stroke. Both appear to be more common in patients with higher discharge mRS, though not exclusively in the case of gastrointestinal hemorrhage. Medications used to treat patients post-stroke may be a contributing factor in this phenomena, but since data regarding medication therapy was not collected in this study, further research may be warranted.

Other diagnoses do not appear to be related to the patient’s discharge functional capacity. This information is also useful for patient and family education. Cerebrovascular disease or recurrent stroke is an example of this phenomena. This confirms that it is vitally important that all patients, regardless of comorbidities, severity of stroke, and discharge disposition, should be educated on warning signs of recurrent stroke. Ischemic and other heart diseases are also examples of conditions that appear to impact all patients regardless of mRS. Education on medication compliance, diet and physical activity should be provided to all patients and families in a manner that is tailored to their functional capacity.
Similarly, readmissions for endocrine, nutritional and metabolic diseases do not appear to be linked to functional capacity. Half of these cases were related to complications in patients with diabetes, including two cases of diabetic ketoacidosis (DKA) and one case of hypoglycemia. The additional three cases were related to hypokalemia or dehydration. Tailoring education for stroke survivors who are diabetic should include reviewing the patient’s ability to maintain a balanced diet and follow their prescribed medication regimen.

Orem’s Theory of Self Care Deficit is appropriate for framing this project. According to the theory, a key role of the nurse is to recognize where a patient is not able to meet his or her own needs, and find ways to help the patient cope with this discrepancy. According to the data collected in this study, the more significant the disability of the patient after stroke, the more likely they are to be readmitted with certain conditions such as urinary tract infection (UTI). The nurse, recognizing this trend, can discuss warning signs of UTI with the patient and family in an effort to promote awareness and prevent more serious complications, such as sepsis. Furthermore, the nurse and hospital staff can recognize this increased risk and examine the likely causes of UTI in discharged patients, ultimately taking steps to reduce risk such as decreasing catheter days and improving catheter hygiene.

Project Deliverables

The primary project deliverable is an examination of all-cause 90-day readmissions after stroke, which is not currently analyzed by the CSC. This information will enhance the knowledge of the healthcare team, and potentially highlight areas where the team can improve transition of care practices. In the absence of statistically significant correlations between mRS and readmission reasons, a general comprehension of the outcomes of our patients and their risk
factors is valuable for guiding education for both staff and patients. Results of this study will be disseminated to stakeholders as an executive summary.

**Advanced Practice Nurse (APN) Contribution to Scholarship and Practice**

According to Moran et al. (2020), the role of the practice scholar is to apply acquired knowledge “within a local context and measure their applicability within settings (translational and implementation science)” (p.44). The practice scholar is a leader in the healthcare setting, advocating for and implementing evidence based practices. Recognizing a potential gap in knowledge, such as the rate of preventable readmissions after stroke, and attempting to provide that additional knowledge is well within the purview of the APN contribution to scholarship and practice. Additional steps can then be made to minimize poor outcomes for high-risk patients.

**Doctor of Nursing Practice (DNP) Essentials**

The following DNP Essentials will be addressed by this project:

*Organizations and Systems Leadership for Quality Improvement and Systems Thinking*

The primary goal of this project was to improve the quality and specificity of education provided to patients and families at the bedside. The collection and analysis of readmission data may provide both bedside nurses and providers with vital information about preventable and non-preventable readmissions.

*Clinical Scholarship and Analytic Methods for Evidence-Based Practice*

As a Doctor of Nursing Practice (DNP) candidate, this project has prepared me for future leadership in nursing, and the critical role of conducting research that can be translated into practice. The research itself provided knowledge that has the potential to improve healthcare outcomes.
Interprofessional Collaboration for Improving the Nation’s Health

The results of this study are not only applicable for bedside nurses, but providers as well. A thorough understanding of readmission data can assist providers in tailoring their own information for the patient and family. Common comorbidities associated with stroke such as atrial fibrillation, coronary artery disease, and diabetes increase the risk of readmission (Bjerkreim et al., 2019), and therefore should be addressed with the patient and family prior to discharge. Ideally, a coherent and complimentary message from multiple members of the healthcare team will improve patient health literacy.

A whole-person approach to nursing care and education is critical to maximizing the health and wellness of the patient recovering from stroke. The nurse who is educated on the risks faced by all stroke patients, such as recurrent stroke, will be better prepared to discuss warning signs and action plans with patients and families. Furthermore, he or she will be able to recognize comorbidities of the patient that may be influenced by their recent stroke, and discuss challenges and tools to enable better health outcomes.

Conclusion

This project had many strengths and weaknesses. The greatest strength is that it examined the risks faced by patients within the first 90 days after their stroke, and isolated the reasons a patient may have an unplanned readmission to the hospital. There has not been an in-depth look at these risk factors among this population. The study found that some readmission diagnoses are more likely to be found in patients who have more significant disability following their stroke, as scored by the mRS. Just as importantly, some readmission reasons are completely independent of functional level. Caregivers can use this information to educate patients and families about their personal risk factors.
Some weaknesses of this project were due to limitations of collection. This study was conducted by a single researcher during the Spring of 2020, in the midst of the covid-19 outbreak in the United States. These unforeseen circumstances decreased the amount of time that could be dedicated to research. Subsequently, the study included a relatively small window of focus. Although 195 subjects were isolated for examination, all of the subjects were discharged during a ten-month window during 2019. Expanding the window, and therefore the number of subjects, would provide more robust information. A more robust sample would also lend to enhanced statistical analysis of individual readmission groups, allowing for concrete relationships to be established instead of trends.

Hospital readmissions are an expensive and often preventable cost in health care. The Medicare Hospital Readmissions Reduction Program (HRRP) was developed during Affordable Care Act reform, with the goal of reducing the upwards of $41.3 billion spent on readmission healthcare every year (“Hospital Readmissions Reduction Program,” 2018). Under this program, hospitals not meeting the benchmark for readmission rates receive reduced reimbursement rates. Although stroke readmissions are not currently a condition listed in the HRRP, they are a publicly reported quality measure that influences hospital ratings (“Outcome Measures,” 2019). One important way to reduce preventable readmissions is to improve discharge teaching (“Hospital Readmissions Reduction Program,” 2018). Armed with more knowledge about the risks facing this unique patient population, nurses and providers will be able to improve education of patients and families.

**Future Implications and Recommendations**

Due to the timing of this project, it was scaled back to focus on a smaller sample set than originally intended. Analysis was then focused specifically on answering the original research
question. However, there are many different ways this data could be approached and examined. Some examples of further research have already been suggested. A more robust sample size would make trends and relationships more evident. Furthermore, an in-depth analysis of the relationship between discharge disposition and readmission diagnosis would also lend to a better understanding of risk factors facing specific patient populations.

Additionally, this project did not include any robust analysis of the differences between patients who were readmitted within 90 days and those who were not. Future analysis could include an examination of comorbidities and their effect on readmission rates. Demographic data could also be considered, as it is not clear if there is a relationship between age, gender, race, ethnicity, etc. and rate of readmission.

With the data that is available here, I would highly recommend that nurses take the time to educate themselves on potential risk factors faced by their patients. Stroke education is an integral part of patient education at the CSC in this study, and should continue to be. All recovering stroke patients, regardless of functional status after their initial admission, are at risk for having another stroke. However, a tailored discharge education should also be based on an analysis of the patient’s current disability and discharge disposition. Nutrition, elimination, mobility, and other basic life functions can be influenced by stroke. The nurse, using Orem’s Theory of Self Care Deficit, can help patients and families to recognize where their limitations may impede a path to optimal health and wellness.
References


Appendix A

IRB Approval of Submission
APPROVAL OF SUBMISSION

February 28, 2020

Dear Marie Campbell:

On 2/17/2020, the IRB reviewed the following submission:

<table>
<thead>
<tr>
<th>Type of Review:</th>
<th>Initial Study</th>
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<tr>
<td>Title of Study:</td>
<td>EXAMINING THE RELATIONSHIP BETWEEN STROKE SEVERITY AND READMISSION: TAILORING PATIENT AND FAMILY EDUCATION</td>
</tr>
<tr>
<td>Investigator:</td>
<td>Marie Campbell</td>
</tr>
<tr>
<td>IRB ID:</td>
<td>STUDY00004130</td>
</tr>
<tr>
<td>Funding:</td>
<td>None</td>
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<td>Grant ID:</td>
<td>None</td>
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<tr>
<td>IND, IDE, or HDE:</td>
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Documents Reviewed:
- HRP-503, Category: IRB Protocol;
- CampbellFinalProjectProposal.docx, Category: IRB Protocol;
- Code Key, Category: Other;
- scientificreview campbell.pdf, Category: Other;
- HIPAA Waiver, Category: Other;
- Data Collection Sheet, Category: Other;

Personnel Changes:

The IRB approved the study on February 17, 2020. The study materials for the project referenced above were reviewed and approved by the SUNY University at Buffalo IRB (UBIRB) by Non-Committee Review. The IRB has determined that the study is no greater than minimal risk.

The UBIRB is requiring a yearly continuing review update submission to Click IRB to monitor the ongoing status of the study February 16, 2021 or within 30 days of study closure, whichever is earlier, you are to submit a continuing review update with required explanations. It is recommended that you submit your continuing review update at least 30 days prior to February 16, 2021.

You can submit a continuing review update by navigating to the active study in Click IRB and selecting ‘Create Modification / CR’. Then, please choose ‘Modification and Continuing Review’ and ‘other parts of the study’ as the Modification Scope. If you are editing study team members, please choose ‘study team members’ as well.
Appendix B

Description of the modified Rankin Scale (mRS)
Modified Rankin Scale (mRS)

<table>
<thead>
<tr>
<th>Score</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No symptoms.</td>
</tr>
<tr>
<td>1</td>
<td>No significant disability. Able to carry out all usual activities, despite some symptoms.</td>
</tr>
<tr>
<td>2</td>
<td>Slight disability. Able to look after own affairs without assistance, but unable to carry out all previous activities.</td>
</tr>
<tr>
<td>3</td>
<td>Moderate disability. Requires some help, but able to walk unassisted.</td>
</tr>
<tr>
<td>4</td>
<td>Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted.</td>
</tr>
<tr>
<td>5</td>
<td>Severe disability. Requires constant nursing care and attention, bedridden, incontinent.</td>
</tr>
<tr>
<td>6</td>
<td>Dead.</td>
</tr>
</tbody>
</table>
Oral Defense Slide Deck
Introduction

Stroke is the leading preventable cause of disability in the United States (Adler et al., 2016) and the third leading cause of death (U.S. Surgeon General, 2015). As many as 10% of stroke patients will be readmitted within 30 days, though half of these readmissions may be avoidable (Zhong et al., 2012).

Key Definitions

Comprehensive Stroke Center (CSC)
A hospital with a robust stroke program and dedicated neurology ICU capable of treating acute stroke patients (Adler et al., 2016).

National Institute of Health Stroke Scale
The most common severity scale used in the assessment of acute stroke in the hospital setting. It consists of 11 items, with a score ranging from 0 to 42. Scores of 0 to 2 indicate minor stroke (mild), 3 to 6 indicate moderate stroke, 7 to 12 indicate severe stroke, and 13 to 24 indicate very severe stroke.

Modified Rankin Scale (mRS)
A scale used to assess the functional status of stroke patients, ranging from 0 (no symptoms) to 6 (death). It considers symptoms such as difficulty with personal care, speech, and ambulation.

Score | Symptoms
--- | ---
0 | No symptoms
1 | No significant disability. Able to carry out all usual activities, despite some symptoms
2 | Slight disability. Able to look after own affairs without assistance, but unable to carry out all previous activities.
3 | Moderate disability. Requires some help, but able to walk unassisted.
4 | Moderately severe disability. Unable to attend to own bodily needs without assistance, and unable to walk unassisted.
5 | Severe disability. Requires constant nursing care and attention, bedridden, incontinent.
6 | Dead.
Background: Causes of Readmission

- Recurrent Stroke
- Other/unidentified etiologies
- Urinary tract infection
- Pneumonia
- Deep vein Thrombosis
- Pulmonary embolism
- Pressure ulcer
- Cerebrovascular disease
- Hemorrhage

(Updated end, 2019)

Patient Education

- Formal and informal instruction
- Discharge education
- Patient and family education
- Discharge education

Supplemented by the Stroke Bundle, which consists of actions 24 hours of admission:

- Descriptions of treatments
- Trans-discharge instructions
- Warning signs that require medical intervention

Project Significance

- The only data currently tracked by the CEC is the 30-day readmission rate
- Redirection diagnosis is not examined
- With an enhanced understanding of the relationship between functional status and readmission reasons, nurses can identify sentinel patients, and family teaching to prevent unnecessary hospitalizations

Project Question

In adult (>18 years old) patients treated for stroke at a comprehensive stroke center (CSC) in Buffalo, NY, who are readmitted within 30 days, is there association between Modified Rankin Scale (mRS) at time of discharge and readmission diagnoses that can be utilized to improve patient and family education?
Objectives

Project Objectives
1. Establish an assessment of the relationship between severity of stress symptoms at time of discharge and readmission diagnosis.
2. Examine the relationship between discharge disposition and readmission diagnosis.
3. Use this information to inform hospital-based caregivers and provide enhanced education to patients and families prior to discharge.

Theoretical Framework

Orem’s Self-Care Deficit Nursing Theory

- The theory of self-care
  - The need and ability of the individual to provide for their own care
  - Self-Care Deficit
    - Uninjured
    - Development
    - Intact
  - The theory of self-care deficit
    - When self-care demand exceeds self-care agency
  - Theory of nursing system
    - The role of the nurse in compensating for deficits

Methods and Design

- Project Setting
  - A comprehensive stroke center (CSC) in Buffalo, NY

- Subjects
  - Adult patient discharged from the CSC between January and October 2012 with a primary diagnosis of "transient ischemic attack" and readmitted within 90 days
  - 55 subjects total
    - Inclusion Criteria: Over the age of 16, index discharge IDMS 6, discharged from the hospital prior to patient procedure
Ethical Considerations

Protection of Subjects
- Retrospective review
- No additional contact with patients or families
- IRB and IRB Board waived
- Medical records will remain within the existing protection of the institution
- Stored in a secure location online
- Compiled data stored on a password-protected Excel document

Data Collection
- Retrospective chart review
  - Medical record number, all admissions and discharge dates, age, gender, and activity code preserved from computer database
  - SSTI stroke admissions were reviewed
  - SSTI patients were isolated and charts were reviewed in the ED
  - SSTI patients not inclusive outcomes
- In addition to primary and secondary manifestation diagnosis, age, race, and ethnicity, comorbidities, and discharge diagnosis were recorded

Correlation with Goal with the Guidelines Database
- Previously collected SSTI data

Data Analysis
- Primary and secondary manifestation diagnosis organized into 21 groups based on type of diagnosis
- Data was analyzed using a Kruskal-Wallis Test
  - SSTI type: SSTI is an ordinal variable and manifesting diagnostic category is a nominal variable, both had several categories
  - Used when assumptions for traditional ANOVA cannot be met

Results
- 189 admitted patients readmitted within 90 days, 17.3% of the total population
- Mean readmission time 31.5 days, range 0-90 days
- 50.3% male, 49.7% female
- Ages range 30 to 97
  - Mean 71.5 years
  - Male 74 years
Results

- Race and Ethnicity
  - 142 (27.3%) Caucasian
  - 166 (31.1%) African American
  - 45 (8.1%) Asian
  - 50 (9.4%) American Indian
  - 31 (5.9%) Hispanic or Latino

- Comorbidities
  - 52.5% acute kidney injury
  - 31.8% diabetes
  - 26.2% CAD

Results: mRS and Readmission Diagnosis

- The study demonstrated that an extended hospital discharge has an effect on the primary readmission diagnosis.
- There was no significant relationship between mRS and secondary readmission diagnosis.

Discussion

- Diagnostic groups related to higher mRS
  - Urinary Tract Infection (UTI)
  - Septic
  - Pulmonary issues
  - Anemia or Various Complications
  - Arterial
  - Major Vascular disease

- Notable diagnostic groups not related to mRS
  - Cardiogenic disease
  - Conduction, nutritional, and metabolic disorders
  - Ischemic and other heart diseases
Conclusion

- Project Deliverables
  - A comprehensive examination of all causes 30-day readmission after stroke
  - Evaluation of the study will be presented to collaborators and staff at the CSC

- DNP Essentials
  - Clinical practice changes based on evidence
  - Quality improvement and evidence-based practice
  - Interprofessional collaboration for improving patient health
  - Advanced Practice Nursing

Strengths and Limitations

- Strengths
  - The first recent study in the CSC
  - Overall sample size

- Weaknesses
  - Small sample size for individual diagnostic categories
  - Small window of collection (13 months)

Future Implications and Recommendations

- Expanding the data set would allow for more detailed examination of relationships
  - Changes in diagnosis and comorbidity diagnosis
  - Higher risk and infection risk
  - Anemia and postpartum bleeding

- With the data available from the study, the nurses should tailor education to the individual and family based on functional capacity
  - General education should occur for all patients recovering from stroke

References
References (continued)

[List of references]

Primary Readmission Diagnosis and mRS

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Primary Readmission Diagnosis and Discharge Disposition

[Table of data]