Post-Stroke Depression Screening and Interventions

Shweta Patel

Jacksonville University

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**Background and Significance**

Depressive disorders have debilitative effects on individuals, families, and communities in all aspects of life (CDC, 2013). According to Beauer, Briss, Goldman, and Bowman (2014), the United States of America (USA) is facing an increased prevalence of chronic disease conditions leading to poor health outcomes, physical and mental disabilities, increased morbidity and mortality, and death. Williams et al. (2011) stated that a stroke is one of the most debilitating chronic conditions and the fifth leading cause of death. Robinson and Jorge (2015) state that approximately 795,000 ischemic strokes are reported in the USA and out of those around 180,000 stroke survivors develop post-stroke depression yearly. According to the American Heart Association (AHA) statistics, 700,000 patients suffer from stroke with a mortality rate of 163,000 annually reported in the USA (Robinson, & Jorge, 2015). The authors included that stroke leads to short and long term physical, cognitive, psychological, social, and economic effects on patients and their families. Post-Stroke Depression (PSD) is the most common chronic condition for patients who suffer from both ischemic, and hemorrhagic strokes.

According to Karamchandani et al. (2015) approximately one third of stroke patients suffer from PSD in acute and chronic phases; cumulative incidence for PSD is 55%. Graven, Hill, Ames, Cotton, and Joubert (2011) stated that PSD has significant impact on the length of recovery and rehabilitation. They recommend that PSD screening needs to be a strategic, collaborative effort by all health care providers and family members to achieve the goal of better quality of life for patients. Graven et al. (2011) signified that the depressive symptoms decrease the rehabilitation participation which negatively affects the health related quality of life. PSD
extends the recovery period resulting in increased care giver's burden, not only physically, but also emotionally and financially.

According to Towfighi et al. (2017), the pathophysiology of PSD is not well understood in the literature but different aspects of PSD can be considered: biological (e.g. location of the lesion, genetic susceptibility, inflammation/ infection) and psychological (e.g. previous history of depression, other psychological conditions, and social separation). These factors depend on timing after the event and the authors suggest that appropriate treatment should target the specific factors (Towfighi et al., 2017). If the patient has a biological cause of PSD, then the patient would be treated with a pharmacological approach for optimum outcome. If the patient has a psychological cause, behavioral therapies and social support from every possible direction would be beneficial.

Most mental diseases are treated in primary/outpatient settings. According to Loeb et al. (2015), approximately 43 to 60% of mental illnesses are treated in primary care. Furthermore, depression screening and diagnosis remain challenged at primary care settings because of the lack of universal protocol. Many times protocols are not used as a standard of care or are incomplete. Mitchell (2016) pointed out that many patients remain untreated for PSD because of the lack of awareness in healthcare facilities and lack of standardized protocol for PSD screening. Since PSD can be treated successfully, it is imperative that these patients are screened by healthcare providers in early periods of depression.

PSD leads to unfavorable health behaviors and poor health related choices to include smoking, inactivity, and non-compliance to the treatment plan (Ayerbe et al., 2014). Other comorbidities like hypertension, hyperlipidemia, and diabetes also play a role in increasing depressive symptoms in stroke patients. Ayerbe et al. (2014) stated that a high recurrence of PSD
in the long term can increase morbidity and mortality. They stated the more risk factors patients have, the greater the chance of having repeated strokes, especially ischemic type. Ischemic strokes leave more lesions in the brain and lead to more incidents of depression and apathy.

**Purpose**

The purpose of the Doctor of Nursing (DNP) project was to implement a process for early identification of PSD in an outpatient neurologic clinic for ischemic stroke patients. The outpatient neurologic clinic was part of a comprehensive stroke center that follows patients after discharge from the hospital. Prior to the project, the clinic did not have a screening process to identify PSD in ischemic stroke patients. The objectives are the following:

1. Identify a tool to screen depression with the ischemic stroke patient population.
2. Implement a screening process to screen all ischemic stroke patients in a neurologic outpatient clinic with the depression screening tool.
3. Provide results of the screening to the healthcare provider of the patient for consideration of continued intervention.

**Literature Review**

**Search Process**

The wide-ranging literature review searched for evidence addressing PSD, its significant effects on patients’ quality of life, and screening tools for PSD used in outpatient settings. Online search engines included the Cumulative Index of Nursing and Allied Health Literature (CINAHL), Google Scholar, Public Library of Science (PLOS), PubMed of the National Library of Medicine, and PsycINFO. Keywords included “stroke,” “prevalence of stroke,” “post-stroke depression,” “depression,” “screening tools for PSD,” “stroke rehabilitation,” “nursing,” “coordination,” “PSD screening strategies,” “screening protocol,” “stroke effects on life,” “acute
The search yielded over 400 results published between 2010 and 2018. The inclusion criteria were (1) English language, (2) publication from 2010 to 2018, and (3) full text. The search focused on post-stroke depression and ischemic stroke. Approximately 48 scholarly articles were identified related to PSD, its effects on patients’ overall short- and long-term health, early screening, treatment, framework, Quality Improvement (QI) model, and rehabilitation participation. Out of these, 21 articles were related to depression screening tools, depression after stroke, and short- and long-term effects of depression on ischemic stroke patients, which are retained for this review. The included articles mentioned a variety of depression screening tools, but the one most recommended with higher sensitivity, specificity, and feasibility in outpatient settings was the Patient Health Questionnaire (PHQ-9). The selected articles included retrospective and prospective cohort studies, systematic reviews, randomized control trials, cross-sectional and observational analysis, and meta-analysis.

**Comprehensive Literature Review Findings**

**Ischemic stroke.** The vast majority of strokes are caused by either thrombus or embolism induced by disrupted brain blood flow and resulting in ischemia. The blockage in the blood flow, or ischemic stroke, accounts for 85% of all strokes (Sander, 2013). According to Sander (2013) there are two main reasons why ischemia occurs within the brain; 1) clot
formation of atherothrombotic plaque which either blocks the vessel itself or becomes loose and
blocks other vessels or, 2) a thrombus that develops in other organs of the body, especially in the
heart, and travels into the brain. TIA (Transient Ischemic Attack) is a type of Ischemic Stroke
(IS) which results from an interrupted blood flow in the brain that clears within 24 hours and the
symptoms resolve. It is a warning sign of a future major stroke attacks. The other stroke cases
are hemorrhagic in nature, which is caused by disruption/damage in the blood vessels wall
integrity in the brain. Dabrowska-Bender et al. (2017) stated that out of all stroke survivors, 44%
to 75% of the patients depend on caregivers or family; around 20% of these stroke patients
require significant social assistance. The authors mentioned that the physical disabilities from
stroke results in less social interactions, low self-esteem, retraction from family and depreciated
QOL.

Ischemic stroke, especially as an acute condition, is a major cause of morbidity and
mortality not only in the USA but globally. The main focus currently in the USA is to identify
and establish specialized facilities to provide optimal care to stroke patients. Boling and Keinath
(2018) mentioned some examples of these facilities; certified Comprehensive Stroke Centers
(CSC), Primary Stroke Centers (PSC), and acute stroke ready hospitals certified by the Joint
Commission. These facilities follow the guidelines and care suggestions provided by the
American Heart Association/American Stroke Association (AHA/ASA). According to the
patients’ current condition and facility’s ability/resources to provide care, patients either get
transferred to other facilities or get care in the same hospital throughout their hospitalization.

Identifying signs and symptoms of Acute Ischemic Stroke (AIS) is vital for optimal care
of these patients. Wilson and Ashcraft (2019) provided a list of signs and symptoms which are:
numbness/weakness on one side of the body, changes in vision, difficulties with speech/trouble
understanding speech, difficulties/changes in gait, changes in balance or coordination confusion/cognitive difficulties, and dizziness. The authors added that the presenting physical symptoms are depending on the location of the stroke in the brain. National Institutes of Health Stroke Scale (NIHSS) is one of the frequently used stroke scales by neurologists, ED nurses, and ED physicians. The scale score ranges from 0 to 42, which determines the eligibility of treatment, and prognosis prediction. The higher the score indicates a higher stroke severity which helps providers to determine appropriate transfers if required according to their hospital resources in taking care of the AIS patients (Wilson, & Ashcraft, 2019).

According to Sanders (2013) AIS can cause cell death in the immediate area of the stroke, but the surrounding area which is called penumbra can be saved with immediate interventions. Giving intravenous thrombolytic drugs (clot dissolvers) within 3-4 hours of onset of the symptoms resulted in impressive improvement. Risk for IS includes non-modifiable factors such as ethnicity, age, and genetics; modifiable factors include hypertension, smoking, diabetes, atrial-fibrillation, dyslipidemia (mostly higher LDL or total cholesterol), poor diet habits, sedentary lifestyle (lack of physical activity), obesity, and increased alcohol consumption.

Secondary prevention of stroke is very important in treating patients (Morris, Carter, & Martin, 2017). In their article with the AHA/ASA recommendations, the authors suggest ways to prevent recurrent ischemic events:

- Lifestyle modifications such as smoking cessation, alcohol in moderation, diet modifications, and increased physical activity.
- Blood pressure (BP) control using Angiotensin Converting Enzyme (ACE)-inhibitors/Angiotensin II Receptor Blockers (ARBs) and thiazide diuretics appropriate for patients.
• Beta blockers use only if other conditions indicate the use.
• Statin medications to lower Low-Density Lipoprotein (LDL).
• Antiplatelet therapy such as aspirin and/or heparin according to the etiology/subtype of IS.
• Appropriate glycemic control based on patients’ disease severity.
• Determining conditions which requires mechanical interventions such as angioplasty or stenting.

From their research Morris, Carter, and Martin (2017) concluded that around 80% of the recurrent strokes can be avoided by application of a multifaceted, comprehensive step wise approach that contains optimum medical management. They added to their conclusion, amongst all the risk factors, smoking cessation as one of the most significant steps to decline the risk of primary as well as secondary stroke.

**DSM-5 criteria for major depressive disorder.** Depression is a common mental condition with around 10% lifetime prevalence in the general population, which increases to 20% in clinical settings (Schmidt, & Tolentino, 2018). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (American Psychiatric Association, 2013) provides criteria to diagnose mental disorders. According to the DSM-5, patients cannot be diagnosed with major depressive disorder unless they have had five or more of the designated symptoms present during the same two-week period and they must represent a change from previous function. Symptoms to assess for depression include the following: depressed mood, loss of pleasure, change in weight or appetite, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue, feelings of worthlessness or guilt, diminished ability to think or indecisiveness and recurrent thoughts of death. The symptoms must cause significant distress or
impair functioning. In order to assess for PSD, patients must have had the symptoms of depression for a minimum of two weeks (DSM-5) (American Psychiatric Association, 2013).

The presence of a major depressive episode is based on the symptom sum described in the DSM-5 criteria (Schmidt, & Tolentino, 2018). The DSM-5 constructs depression as a unidimensional disorder, but there are studies that describe subtypes of depression. Schmidt and Tolentino (2018) pointed out somatic and non-somatic symptoms in depression. Somatic symptoms include, difficulties in sleep pattern, weight and appetite changes, difficulties in concentration, fatigue, and retardation or psychomotor agitation. The non-somatic symptoms include, anhedonia, worthlessness, depressive mood, and suicidal thoughts. The authors added that depression severity is associated with cognitive disabilities, age, suicidal ideation, and unemployment. Compared to a non-depressed person, a moderately depressed person would express increased sleep difficulties, changes in weight or appetite, increased agitation, or retardation. Patients with severe depression are further characterized by suicidal thoughts, and worthless feelings (Schmidt, & Tolentino, 2018).

In discussion of major depressive disorders, Adjustment Disorder (AD) with depressed mood is also associated with depression. Bachem and Casey (2018) described AD as a disorder caused by the stressful event by which some individuals are affected severely, resulting in distress and incapacitating life functioning even at the level of day to day activities. The authors added that the most difficult part of diagnosing AD is differentiating from the normal stress level, which in most cases is unclear. Strain (2018) discussed brain and body roles in response to stress. The author stated that the body and the brain are in a continuum of communication through the various systems such as autonomic, neuro-endocrine, immune, and metabolic. Stress is the foremost factor in mental illnesses, and the brain is the key to responding to stress. Strain
(2018) pointed out that disruption of brain-body communication leads to pathophysiological changes in body systems, as well as brain related changes resulting in psychological disorders. Strain noted the hippocampus, which is the memory center in the brain, atrophies with long standing stress in major depression, type-2 DM, PTSD (Post-Traumatic Stress Disorder), decreased or lack of exercise, and chronic inflammatory conditions. In contrast the hippocampus increases in size by exercise, high level of learning, and treating other conditions mentioned. Finally, Strain concluded that disturbance or changes in the brain results in mood disorders by increased level of stressors (2018).

**Ischemic stroke and depression.** Despite high prevalence and negative consequences of depression on overall health of stroke survivors, the amount of attention in practice and research are less in comparisons to the physical disabilities after stroke (Vicentini et al., 2017). Vicentini et al. (2017) found substantial association between right hemisphere ischemic stroke and incidence of depression within one to six-month post stroke in their extensive review of the literature. Lewin-Richter, Jöbges, and Werheid (2015) did a prospective study to find prevalence of depressive symptoms after six months in ischemic stroke patients. They concluded that depressive symptoms after ischemic stroke are prevalent, and ambulatory care settings should implement prevention and treatment in a timely manner. They also discussed patients had more depressive symptoms after one- and three-months following discharge from the hospital in ischemic stroke patients’ population (Lewin-Richter et al., 2015).

McCarthy et al. (2016) did a study to find depressive symptoms in ischemic stroke patients. They recruited and assessed 322 ischemic stroke patients both in the hospital and also three months after discharge. They controlled for known predictors of depression such as history
of depression, stroke severity, and post stroke disabilities. The results showed higher incidence of depressive symptoms at three months in age groups of 25-54, and 55-64.

There is a debate reflected in the literature regarding whether the psychological distress related with physical disability might contribute to the PSD development. Loubinoux et al. (2012) compared stroke patients and orthopedic patients with similar physical disabilities in the hope that it may help with understanding PSD and its association with physical disabilities. According to the authors, if one cannot prevent stroke, at least try to decrease its long-term sequelae. Benefits of using SSRIs in post ischemic stroke patients suffering from depression were also addressed. Furthermore, Loubinoux et al. (2012) conveyed that depression related symptoms and severity are dependent on the location of lesions in the brain post ischemic stroke. From their literature review, there was a difference in PSD frequency of left compared to right hemispheric lesions. The left hemispheric lesions, especially frontal lobe lesions, are associated with higher rates of depression. However, they said that the systemic review did not support their argument (Loubinoux et al., 2012).

Ginkel et al. (2015) debated whether brain damage causes depression or whether associated disabilities caused the depressive symptoms. Symptoms after stroke, such as lethargy, sleep disruptions, changes in appetite, and decreased ability to concentrate, are difficult to differentiate as depression or as a sequela of stroke. They concluded these somatic symptoms after stroke are considered PSD. They pointed out that because of the increased prevalence of PSD, early screening, detection of PSD, and treatment planning are crucial.

**Screening tools for depression.** Depression screening tools provide health care providers with a simple design and consistent method of identifying patients at risk for depression. There are many types of depression screening tools discussed in the reviewed
literature. There are self-screening tools that the patient self-administers and there are Health
Care Provider (HCP) administered screening tools used to assess and observe to determine
screening tools for depression include Patient Health Questionnaire (PHQ-2), PHQ-9, Beck
Depression Inventory-II (BDI-II), SDS (Zung Self-Rating Depression Scale) and Kessler
Psychological Distress Scale (K-10); whereas the clinician administered tools are, HADS
(Hospital Anxiety and Depression Scale), Harvard Questionnaire, GHQ (General Health
Questionnaire), and SCL-R (Symptom Checklist Revised) Depression subscale. Since there are
both self-administered and clinician administered screening tools are available, it is feasible to
use a patient administered tool in a busy outpatient care clinic. Turner et al. (2012) mentioned the
most commonly used depression screening tools in primary as well as specialty care settings are:
PHQ-9, Hospital Anxiety and Depression Scale (HADS), Distress Thermometer (DT), and BDI-
II. The PHQ-9 was recommended as a depression screening tool for screening stroke patients due
to its briefness and psychometric properties. After examining different depression screening tools
in stroke patients, Turner et al. (2012) concluded that PHQ-9, PHQ-2, and HADS were more
patient friendly and easy for the patients to fill out by themselves. El-Den et al. (2018) did a
systemic review regarding psychometric properties of different screening tools for depression for
primary care adult patients. The PHQ-9 was the most evaluated with 14 publications from 11
countries which gave the tool high sensitivity and specificity, as well as more reliability and
validity.

Ginkel et al. (2015) used PHQ-9 to screen patients in a primary care setting to compare
severity of depressive symptoms in post-stroke patients and general population. Their study
included seven general practices and three hospital settings. According to their study the PHQ-9
screening tool which was scored by patients showed high satisfaction and ease of use in both hospital and outpatient settings. Patients were also able to fill out the PHQ-9 at home and mail it back to the office at the sixth- and eighth-week post stroke. The only limitation with PHQ-9 mentioned by Ginkel et al. (2015) was that the participant patient must not have communication/cognitive difficulties. Eeden et al. (2015) used HADS to screen post stroke inpatients who were 18+ years old and able to communicate. They recommended further research of HADS with a larger population, but they were not satisfied with that screening tool. Ayerbe et al. (2014) used HADS to assess depressive symptoms in stroke patients in the hospital and three months later. They mentioned the use of HADS was useful, but a diagnostic screening tool would be a better fit for these patients around 3 months. Turner et al. (2011) used PHQ-2, PHQ-9, HADS, and Beck Depression Inventory-II (BDI-II) to ensure the accuracy of these screening tools for three or more weeks post stroke patients. Burton and Tyson (2014) examined 27 screening tools and selected PHQ-9, Stroke Aphasic Depression Questionnaire-Hospital version (SADQ-H), Geriatric Depression Scale (GDS-15), and HADS for their study. They mentioned that PHQ-9 and GDS-15 can even detect milder depressive symptoms and is feasible in clinical practice. They stated the HADS is accurate, but clinical utility is not practical (Burton, & Tyson, 2014).

**PHQ-9 use for stroke patients.** PHQ-9 screening tool does not determine a final diagnosis, rather it is the first step to help clinicians determine if a patient may be depressed or not as it is subjected to patients’ retrospective recall. Torous et al. (2015) stated, PHQ-9 is a validated self-administered depression screening scale in both primary /outpatient and psychiatric settings. Torous et al. (2015) did a study regarding the smartphone application (app) of PHQ-9 use. They recruited outpatient psychiatric clinic patients in the study, and they were
asked to fill out both the smartphone version of the PHQ-9 and the traditional paper version. The study concluded that the smartphone version and the traditional paper version filled out by the patients at the clinic showed correlated results. The results also suggested that patients with major depression may score higher on the smart phone app than to a clinical provider (Torous et al., 2015).

Burton and Tyson (2015) conducted a systematic review of depression screening tools to select the best fitting instrument for PSD. They recommended PHQ-9 for the PSD screening and Stroke Aphasic Depression Questionnaire- Hospital version (SADQ-H) for patients who cannot report their symptoms. The PHQ-9 was described as very easy to complete and had high reliability and validity. Towfighi et al. (2017) did 24 studies to find out the best tool for PSD, with a sample size of 2,907. The most sensitive and validated tools for detecting PSD were PHQ-9 and HADS. These tools were used for the patients who can participate by verbal communication and had less cognitive impairments.

Karamchandani et al. (2015) modified the PHQ-9 and achieved about 75% of PSD screening in both ischemic and hemorrhagic patients by implementing the MPHQ-9 screening tool. The authors changed the original version of the tool because of needed hemorrhagic stroke population screening and the severity of related neurological challenges. Turner et al. (2011) investigated the accuracy of different depression screening tools for post stroke patients and recommended PHQ-9 for the primary care settings with higher specificity and sensitivity. Meader et al. (2013) did a meta-analysis of ischemic stroke patient’s depression screening by the PHQ-9 tool and measured its feasibility with a sample size of 552 patients. Turner et al. (2012) mentioned PHQ-9 tool use for PSD in many studies and for patients who do not have
aphasia after stroke. Their sample size of stroke patients was 124, and the main inclusion criteria was adult patients with no aphasia (Turner et al., 2012).

**Guidelines for assessing PSD.** According to McIntosh (2017) the prevalence of PSD ranges from 30-50% and are influenced by the inconsistency in definition and criteria of PSD, lack of standardized screening practices, lack of knowledge and skills of clinicians administering screening, and timeframe of index stroke. The author stated within the first 12 months of initial stroke the outpatient visits increased by 1.3 times.

Burton and Tyson (2015) stated that according to the clinical guidelines of the National Stroke Foundation (NICE, 2010) stroke patients should be routinely screened for the manifestations of mood disorders utilizing a validated screening tool. Karamchandani et al. (2015) mentioned that PSD screening is recognized as a requirement for Comprehensive Stroke Centers (CSC) sponsored by the Joint Commission. The American Heart Association/American Stroke Association 2018 guidelines (under guideline 4.9.- depression screening) clearly state that all ischemic stroke patients should be screened for depression during hospitalization and after discharge, although the timeline is not delineated (Powers et al., 2018).

**Continuous monitoring.** Ongoing monitoring is a very important aspect for any new quality improvement process to be successful. The monitoring is done by benchmarking, or comparisons, to assure the goals are met. The stakeholders also are interested in knowing the progress, and there should be an established reporting system at predetermined intervals. The ongoing monitoring starts from the implementation phase where the healthcare team has clear understanding of why it is being implemented and what is trying to be achieved (Sylvia, & Terhaar, 2014). According to Sylvia and Terhaar (2014), another important reason for ongoing
monitoring is that various stakeholders require regular information to manage and make decisions regarding the intervention.

**Key Points from Literature Review**

Based on the literature review, the results show PSD is highly prevalent and necessary steps should be taken to recognize, treat, and prevent it. The main points extracted from all the relevant selected PSD studies are:

1) Depression is a very common recurring chronic condition after stroke (Williams et al., 2011).

2) One third of patients suffer from either mild, moderate, or severe depression following stroke (Loubinoux et al., 2012; Karamchandani et al., 2015).

3) PSD increases physical, psychological, emotional, social, and financial disabilities (Ayerbe et al., 2015).

4) PSD increases healthcare costs of stroke patients (van Eeden et al., 2015).

5) PHQ-9 is considered an appropriate tool for PSD screening and is easy to use (Turner et al., 2011; Loeb et al., 2015).

6) Early screening of PSD improves overall health related quality of life (Dąbrowska-Bender et al., 2017).

7) Most patients who have experienced a stroke and have potentially been evaluated in an emergency setting typically receive further intervention in outpatient settings two-weeks or later post-stroke (McIntosh, 2017).

8) Appropriate treatment through either pharmacological (e.g., SSRIs), and/or non-pharmacological (e.g. neuromodulator, and behavioral therapy) are warranted for patients suffering from depression after stroke (Turner-Stokes, & Hassan, 2002).
Key Terms

**Depression.** Depression is a common mental disorder, characterized by persistent sadness and a loss of interest in activities that you normally enjoy, accompanied by an inability to carry out daily activities for at least two weeks (Uher et al., 2014).

**Ischemic stroke.** Ischemic stroke occurs as a result of obstruction within the blood vessels supplying the brain and compromising brain circulation (AHA/ASA, 2018).

**Hemorrhagic stroke.** Hemorrhagic stroke occurs as a result of weakened blood vessel rupture in the brain parenchyma, and the leaked blood acts as a space occupying lesion compromising brain function (AHA/ASA, 2018).

**Comprehensive stroke center.** In 2012, the AHA/ASA and Joint Commission launched comprehensive stroke center certification. These centers are capable of providing high quality care to complex stroke and cerebrovascular diseases. These centers possess highly trained medical staff, advanced imaging, and organized infrastructure (Gorelick, 2013).

Framework

**Model for Improvement**

Improvement in the quality and safety of healthcare remains a challenge. Per Taylor et al. (2014), Quality Improvement (QI) methods have been applied such as “Plan Do Study Act (PDSA)” cycle to improve current practice and provide quality care to patients (IHI, n.d.). They added that selecting effective QI methods to test and evaluate interventions to care is crucial for delivery of optimal quality care in a financially compelled setting. PDSA is mentioned as the central part of the QI initiatives in many healthcare settings with significant improvement in care delivery, and patient outcomes (Taylor et al., 2014).
Asomaning and Loftus (2014) did a study utilizing the PDSA model to implement an Identification of Seniors at Risk (ISAR) tool for screening patients in the emergency department of a local hospital. The PDSA model helped understanding of key barriers and facilitators in implementing the ISAR tool. The study results showed the PDSA model as a framework served many successful strategies for sustaining the QI project (Asomaning, & Loftus, 2014).

Gillam and Siriwardena (2013) explained the PDSA cycle stages as repetitive, small scale-based tests of change carried out in a parallel manner to measure to what extent the changes worked before implementing the changes on a large scale. They further explained the stages of the PDSA cycle as:

1) Plan- explains how to develop a plan and define objectives of any QI project.

2) Do- explains when to implement the plan and gather related data.

3) Study- involves data analysis and a review of what has been learned.

4) Act- modifying plan to achieve success.

To implement the PSD screening at the outpatient neurology clinic, PDSA would be the good fit to follow as a QI model. “Plan” encompasses the literature review and seeking approval for the study through the Graduate Committee, the site, and the IRB. “Do” is the implementation phase and includes teaching the protocol for screening all ischemic post-stroke patients at the identified site and collecting the screening sheets and scoring them. “Study” is analyzing the PHQ-9 scores and data collected during implementation phase with the assistance of a statistician. “Act” includes sharing the results with the staff of the site and discussing ways to develop an ongoing protocol to screen, assess, and intervene for PSD. In Appendix-B, the PDSA cycle gives visual description of all steps.
Theoretical Framework

Having theoretical knowledge and application to routine clinical practice is very important for healthcare professionals to optimize the patient care delivered. Pender’s Health Promotion Model (HPM) is easy to understand and can be applied routinely in many aspects of patient care. Health promotion of an individual or client is the goal of every medical professional providing care (Pender, 2011). Nola Pender proposed the HPM to foster health status of an individual through active participation in improving health. As stroke patients have long term recovery and disabilities, sometimes permanent, they may suffer from depression which restricts their participation in rehab and further treatment. Graven et al. (2011) said healthcare personnel should intervene to find any presence of depressive symptoms in post stroke patients to decrease the length of recovery, decrease health related costs, and increase self-awareness of participation in treatment. Therefore, the HPM application to practice in specific patient populations can improve their outcome and quality of life.

In Appendix-C, the HPM explains that each individual is a “multidimensional holistic individual” who constantly interacts with psychological and somatic environments. This model indicates that active participation of an individual helps them to achieve their health-related goals. The theory offered considerable emphasis on health promotion and disease prevention (Pender, 2011). Thinking about the psychological state and the health outcome in regard to PSD patients, it is crucial to initiate early interventions for depression screening, treatment, and prevention in this specific patient population. Moreover, according to Alkhalaileh, Khaled, Baker, and Bond (2011) this theory is widely accepted by the nursing profession in practice, research, and education. They pointed out that community health care settings are the best avenue in promoting health and preventing illnesses. In regard to stroke patients, this theory can
be applicable in their health promotion in both hospital setting, and community settings in long term.

Assumptions applied to PSD patients.

I. “Individuals seek to actively regulate their own behavior” (Pender, 2011, p. 5). This assumption applied to the stroke patients who suffer from the depression. If patients do not overcome from depression or get treatment for the depressive symptoms, they do not participate in rehabilitation by regulating their behavior and improve their life quality.

II. “Health professionals constitute a part of the interpersonal environment, which exerts influence on persons throughout their life span” (Pender, 2011, p. 5). Health care providers play a major role in stroke patients’ recovery. Patients and the health care providers work as a team to get better outcomes and early prevention of related disease comorbidities. Support for active participation in rehab activities enables patients to improve self-confidence and health related behavior (Graven et al., 2011).

III. “Self-initiated reconfiguration of person-environment interactive patterns is essential to behavior change” (Pender, 2011, p. 5). Stroke patients often develop emotional disturbances with PSD and post-stroke emotional incontinence being relatively common. The social impact of these emotional changes can be stressful for both patients and their families, adversely influencing patient quality of life. Therefore, stroke patients need constant interactions, communication, and social support for essential behavior change and optimum health status (Choi-Kwon et al., 2012).

Major propositions related to PSD patients.

I. “Prior behavior and inherited or acquired characteristics influence beliefs, affect, and enactment of health-promoting behavior” (Pender, 2011, p. 5). This proposition explains
that patients with already emotionally sensitive personal or cultural beliefs and less social support suffer more with psychological decline after stroke. PSD patients can be challenging with other precipitation factors to promote their health enhancing behavior.

II. “Families, peers, and health care providers are important sources of interpersonal influence that can increase or decrease commitment to and engagement in health-promoting behavior” (Pender, 2011, p. 5). Health care providers, families and friends should be involved in plan of care for PSD patients from hospital to rehab, and ultimately at home.

III. “Situational influences in the external environment can increase or decrease commitment to or participation in health-promoting behavior” (Pender, 2011, p. 5). When patients suffer from depression after stroke, it adds into devastating short- and long-term health outcomes. Until patients can get treatment for depression they cannot achieve health promoting behavior. Health care practitioners should be committed to early screening, and intervention for depression in stroke population.

Project Design

Project Objectives

The overall goal of this quality improvement project was to detect depression early in post ischemic stroke patients in an outpatient setting in order to implement early treatment and help patients reach optimum health related quality of life.

Process objectives. 1) Train staff at the designated outpatient neurology clinic to administer the PHQ-9 with demographic information to all post ischemic stroke patients, 2) Score all PHQ-9 screens and provide the total score and individual scores to the physician with the physician interpretation and intervention sheet, 3) Collect patient self-scored PHQ-9s
with demographic data and physician checked interventions, and 4) Maintain a matrix with de-identifiable information of individual PHQ-9 scores, correlated demographic information and physician checked interventions for statistical analysis in a password-protected computer.

**Outcome objectives.** 1) Early identification of depression in post ischemic stroke patients, 2) Physician/healthcare provider assessment and appropriate interventions based on the score as described in Appendix-D, and 3) Protocol for ongoing screening for PSD in an outpatient neurology setting.

**Intervention**

The intervention was a screening process to detect PSD in post ischemic stroke patients in an outpatient neurology clinic using the PHQ-9 and a demographic sheet. The neurologist was provided with the results and determine any further assessment treatment needed.

**Setting and Facility Support**

This quality improvement project setting was an outpatient neurology clinic in Jacksonville, Florida. The clinic was treating patients 2-4 days per week and had three different branches at different locations. All three locations were used to cover maximum targeted patients’ population. The clinic was run by two neurologists, an office manager, and two Medical Assistants (MAs). All three locations were run by the same staff. The clinic was also affiliated with an acute care hospital, which was a comprehensive stroke center. The hospital, as a part of the comprehensive stroke center, supported this quality improvement initiative to better serve their patients. The neurologists were very supportive of the project implementation and were willing to make any changes to current practice to provide improved quality care to the patients. The office manager supported the DNP student in all aspects in project implementation. The MAs at the clinic were willing to give the PHQ-9 screening form to all ischemic stroke patients...
and collect them in an organized manner. One of the MAs was very familiar with the PHQ-9 and has used it in the past at a primary care clinic. The institution QI committee members of the project setting were supportive of this project implementation to better serve the post-ischemic stroke patients.

**Population**

The targeted patient population was post-ischemic stroke patients. Most of the patient population of post-ischemic stroke were from the acute care hospital and continue their care in an outpatient clinic. The study population also included post-ischemic stroke patients not previously hospitalized for treatment of their stroke. Patients with only hemorrhagic strokes were not involved in this project implementation in order to assess a subset of stroke patients who typically have higher functioning than hemorrhagic stroke patients.

**Inclusion criteria for patients.**

- Age 18 years of age or older
- Had ischemic stroke
- If literacy barrier, physical or visual impairment, the patient is accompanied by a care giver/family member who can assist with completing the PHQ-9.

**Exclusion criteria for patients.**

- Had hemorrhagic stroke
- Cognitive impairments that impair answering the PHQ-9
- Aphasia
- Patient does not have a caregiver/family member to assist with completion of the PHQ-9 related to literacy level, language barrier, physical or visual impairment without a caregiver/family member to assist with completing the PHQ-9
Assurance of Privacy

Permission was obtained from the Jacksonville University (JU) Institutional Review Board (IRB) to implement the project. The clinic was affiliated with a hospital that has an Institutional Review Board; the DNP student obtained permission from that board. The Health Insurance Portability Accountability Act (HIPAA) guidelines were followed from beginning of the project to the completion (Stubbs, & Ozuner, 2015). In this project implementation and data collection process, patients’ personal information was not used except age and gender. The DNP student did not have personal contact with the patients. The student prepared a matrix to include each patient with their age, gender, days since last stroke and each score on each of the nine PHQ-9 questions, the total score, and the physician intervention. This matrix was used for data analysis and stored in a password protected compute. The data used in matrix was totally deidentified and the paper PHQ-9 forms were placed in a locked cabinet.

Project Implementation

The DNP project was a Quality Improvement (QI) process for the neurology clinic. For this process only ischemic stroke patients were included for data collection and analysis. Before the implementation, the MAs were trained how to fill out the specific required information on the PQH-9 to include date of administration, type of stroke, and date of last stroke before the questionnaire was given to the patient for completion. The MAs at the clinic administered the paper PHQ-9 to each patient and the MAs wrote the date of administration, the type of stroke the patient had, and the date of the last stroke. On the form the patients indicated their age and gender. The patients self-scored the PHQ-9 form. The MAs collected the form and briefly reviewed for completion, totaled the nine PHQ-9 scores, and wrote the total score on the form. The MAs were instructed to notify the provider immediately if patients indicate yes to question-9
which is related to suicidal ideations. The physicians reviewed the results of the PHQ-9 and the potential endorsement of questions 1 and 2, which strongly suggested potential depression. The physicians also noted the total score and after interviewing the patient, checked what intervention was decided. The physicians intervened based on their assessment, and followed steps described in Appendix-D.

At the conclusion of the patient intervention with the physician, the MAs scanned the completed PHQ-9 into the electronic health record and placed the paper copy into a date labeled daily envelope. Each day of the week had an envelope to store completed and scanned PHQ-9s. The staff followed the same steps at all three locations. On the top of the envelope the location of the clinic was also indicated. The student collected the envelopes weekly/ biweekly with the completed PHQ-9s inside and secured them in a locked file. The DNP student had no direct contact with patients and did not have personal identifying information other than age and gender. The student prepared a matrix to include each patient with their age, gender, days since last stroke, and score on each of the nine PHQ-9 questions, the total score, and the physician intervention. This matrix was used for data analysis and was stored in a password protected computer.

Training “Lunch and Learns” took place with MAs to cover the following goals. 1) Importance of depression screening for post-ischemic stroke patients, 2) Description of the PHQ-9 and meaning of scores, 3) Clarification of the patient inclusion and exclusion criteria, and 4) Specifying the path of the PHQ-9: patient self-scores and writes demographic information, MA sums the answers and adds information, MA provides scored form to the physician who determines intervention and notes on form, MA scans into chart and places paper scored form with all information in daily envelope for collection by DNP student on a weekly basis.
Instrument Measures

The primary goal of this post stroke depression (PSD) screening initiative is to identify and treat, or refer for treatment (if necessary), patients at risk for depression by screening after stroke in order to mitigate the consequences of under-recognized and under-treated depression. Evidence-based strategies for the screening and treatment of depression have been developed that could be used in the acute care settings (Loeb et al., 2015). The depression screening was implemented using the PHQ-9 screening tool, which is described in detail in Appendix A. The PHQ-9 was developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues, with an educational grant from Pfizer Inc. for primary care centers. No permission was required to reproduce, translate, display or distribute the tool. According to McIntosh (2017) the PHQ-9 has been validated in patients with stroke and was found to have good brevity and good psychometric properties when used in patients with stroke, in addition to being a good brief screening tool for PSD.

Burton, and Tyson (2015) did a systemic review on clinical utility of different depression screening tools to choose a good fit for PSD. They recommended PHQ-9 for the PSD screening, and Stroke Aphasic Depression Questionnaire-Hospital version (SADQ-H) or patients who cannot report their symptoms. Towfighi et al. (2017) recommended PHQ-9 based on its higher specificity, and sensitivity, which was 95% for both. This tool was used for the patients who can participate by verbal communication, and less cognitive impairments. Meader et al. (2013) did a meta-analysis of ischemic stroke patients depression screening by PHQ-9 tool and measured the feasibility. Their results showed 86% sensitivity, and 79% specificity of this tool in PSD screening (Meader et al., 2013). Turner et al. (2012) mentioned that PHQ-9 tool is recommended in many studies they have reviewed for PSD, and its usefulness for primary diagnosis of major depressive syndrome. They
recommended to use this tool for patients who do not have aphasia after stroke. The results showed PHQ-9 specificity of 92%, and sensitivity of 85% (Turner et al., 2012).

**Timeline**

Permission was obtained from the Jacksonville University (JU) in September 2018 for the DNP project. The staff at the neurology clinic was trained with step by step implementation of the screening process in the month of October of 2018. This took about a week to have at least two face-to-face meetings. The first meeting involved staff training and individual roles. The first meeting was scheduled as a lunch and learn activity. The second meeting involved answering any questions from staff and resolving any confusions/concerns regarding implementation process. Staff who could not attend the first meeting were also be trained on separate days. The IRB approval process took about two months. The JU IRB approval was obtained in December 2018, and the Baptist IRB approval was obtained in the beginning of January 2019. The screening tool implementation targeted timeline was from January 2019 to April 2019, as planned for a duration of three months. Data collection was extended an additional month due to unexpected staff circumstances that prevented data collection the original third month. The data was collected at the end of each week throughout the active implementation period. The targeted timelines for this DNP project is organized by table form in an Appendix-E.

**Stakeholder Assessment**

The primary stakeholders for this project were the neurologists at the clinic who had been very supportive of this quality improvement step in ischemic stroke patients’ assessment and plan of care. The office manager supported all aspects of the project implementation. The MA at the clinic gave the PHQ-9 screening form to all ischemic patients and collected them in an
organized manner. The institution QI committee of the project setting members were supportive of this project implementation to better serve the post-ischemic stroke patients.

**Fiscal Consideration**

There was no financial requirement in implementation of this project.

**Ethical Considerations**

This QI project was for a neurology clinic and may benefit all future patients screened for depression by providing information to the provider for consideration about patient depressive symptoms. Patients were given the opportunity to complete the PHQ-9 prior to seeing the physician. Patients may be concerned answering questions related to their coping and did have access to immediate support by the healthcare provider at the clinic. Patients were given a contact number of Jacksonville University office of research compliance to ask any questions or issues later on. Patients were given option of not to participate if they wish, or can choose not to answer any particular question on PHQ-9. Based on the PHQ-9 screening tool, the physician identified depressive symptoms earlier than later, assessed the patient with the PHQ-9 information, and intervened if appropriate to improve the overall outcome for these patients.

**Findings/Results**

**Summary of Data**

The descriptive statistical analysis of 75 total patients participating showed males were 53.3% (n=40) and females were 46.7% (n=35). Patients ages ranged from 34-95 years (n=75) and the average age range was 63-66 years who suffered from PSD. Table-1 (Appendix-G) shows the results of all nine questions of PHQ-9. The total score mean was 4.7 (5.34%); the maximum score reported was 21. Most patients (84%, n=63) reported a total score less than 10 (not requiring further evaluation for depression) 6.6% (n=5) reported a total score between 10-
14 (may indicate mild depression) and 9.3\% (n=7) reported a score of 15 or more (indicating a provisional diagnosis of moderate to severe depression). Thirty two percent (n=24) reported being tired or having little energy more than half their days during the previous two weeks and 23\% (n=17) endorsed sleep problems for at least more than half their days during the previous two weeks. Per Table-1/ Appendix-G, approximately 31\% (n=23) patients out of 75, reported the checked off problems contributed to the following: made somewhat difficult to do their work, take care of things at home, or get along with other people. Appendix-H shows percentage of all question comparisons, and individualized questions in each figure. All recorded data were descriptively summarized. Appendix-F shows the different variables used in data analysis. Summary tables are provided for all variables. All statistical analysis is conducted at 5\% significance level using R version 3.4 (R Foundation for Statistical Computing, Vienna, Austria) and/or SAS version 9.4 (SAS Institute Inc., Cary, NC).

**Project Goal**

The overall goal of this QI project was to detect depressive symptoms early in post ischemic stroke patients. This goal was met through establishing a process of administering the PHQ-9 self-administered form to patients diagnosed with post ischemic stroke in neurology clinics. Out of the 75 patients screened who met the study criteria, 19\% (n=14) endorsed questions that flagged them for the neurologist to indicate they needed further screening. Of those patients screened further by the neurologist, twelve patients (16\%,) screened 10 or higher possibly indicating they may be experiencing at least a mild depression but can only be confirmed after a clinical assessment. Three patients endorsed thoughts of being better off dead or having thoughts of hurting themselves and only one in that group also scored 10 or higher. The total PHQ-9 score for those three patients with suicidal ideations were: 5, 9, and 19. The
patient with a total PHQ-9 score of 19 (reflecting moderate to severe depression) was already under treatment for depression determined by the physician assessment and did not need further intervention.

In total the neurologist determined that four patients were already in treatment for depression and twelve more patients were assessed and the neurologist determined they needed no further interventions. The neurologist did not refer any patients for further intervention. The neurologist was made aware of significant symptoms many patients were experiencing that impacted their ability to function. Though not necessarily reflecting depressive symptoms, 53% (n=40) of patients reported feeling tired or having little energy several days or more which also may impact quality of life and ability to function.

**Process Objectives**

The process objectives were met by training the staff which included two MAs, and two physicians. The MAs and physicians were given handouts of PHQ-9 form and physician intervention checklist during lunch and learn activity. The DNP student went through each question of the PHQ-9 form and reviewed all options for the physician intervention checklist with all the staff members who were going through the training. Clarification of any questions regarding the implementation process was welcomed. The MAs scored each PHQ-9 form after patients filled out the questions and scored the total at the end. The MAs then forwarded the scored form to the physician. The physicians examined patients and talked about the indicated depressive symptoms on the PHQ-9 forms, then they intervened according to the assessment. The filled forms with de-identified data were collected by the DNP student from the clinic every one-two weeks and transferred the data in a password protected computer. The data was maintained in a matrix form in the computer. The paper forms were placed in a locked cabinet.
Outcome Objectives

The first outcome objective was early identification of depression in post ischemic stroke patients. This was accomplished by providing ischemic post stroke patients with a self-screening tool, the PHQ-9, to self-identify symptoms and functioning that may indicate a need for further assessment for depression. This occurred in an outpatient neurology clinic and was offered to each patient that met the study criteria. The second outcome objective was physician/healthcare provider assessment, and appropriate interventions based on the score and/or endorsement of suicidality. Because of score availability and results of the PHQ-9 at the beginning of the physician’s assessment, 19% (n=14) of patients had a direct communication with the physician inquiring about depression and this determined that either the patient was already in treatment for depression or was stable and did not need further intervention at that time. The third outcome objective was establishing a protocol for ongoing screening for PSD in an outpatient neurology setting. The process objectives provided the needed training and implementation for depression screening using the PHQ-9 which was accepted as a protocol going forward by the clinic staff.

Recommendations/Implications

Depression is very common in the general population, afflicting one in five adults in the USA (Greenberg et al., 2015). Depression is more common in people with physical disabilities, particularly those with long term disabilities. Since adults at any age can suffer from depression, it is crucial for health care providers to assess or screen the general population for depression. The economic burden of this chronic condition is increasing in the USA. Greenberg et al. (2015) reported the total cost as 210.5 billion dollars annually, and 38% only contributed to the major depressive disorders. They also added that about 400 million disability days accounted to depression per year in the USA. Because of the increasing burden of this disease condition health
care providers should give special attention to the early diagnosis through appropriate depression screening, treatment, and prevention of further complications in the stroke population.

There is a need for a standardized protocol for PSD screening in every health care facility of the stroke patient population at both outpatient and inpatient settings. Since in the literature there is no defined timeline mentioned or recommended to screen post stroke patients for depression, it is beneficial to the patients and providers to follow PSD screening on a regular basis. Screening could begin as early as two weeks post-stroke in an inpatient setting or at each office visit in an outpatient setting.

This QI project was a one-time screening and it would be important to continue screening stroke patients on subsequent appointments. Data that was collected for this study did not indicate whether patients were already under treatment for depression. Out of the 81.3% (n=61) who did not require any further assessment, some of those patients may have already been in treatment for depression and the treatment stabilized their functioning so that depression was not evident in the screening process. It would be helpful for providers to be aware of pre-existing depression stabilized with treatment because these patients may be at risk for relapse related to challenges of coping with a stroke. This will increase the awareness of the physicians to address challenges for the patient. Providers should pay extra attention to patients who have had more than one stroke and suffer from various physical and psychological disabilities. Physicians should discuss the importance of psychological support with family members or care givers. The recommended pharmacological treatment for PSD, such as antidepressants, and non-pharmacological treatment, such as behavioral therapy or counseling, may be beneficial too. Every outpatient clinic that has a stroke patient population should screen patients for depressive symptoms.
As discussed previously, PHQ-9 is the most reliable tool for the stroke patients’ population; its use to screen post-stroke patients is validated. In addition, the PHQ-9 is a self-screening tool and opens conversations with providers. Appropriate treatment plans should be in place according to the total score of the screening. Even if the total score is not high enough to indicate major depression, it can still indicate which area the patient needs help to improve their quality of life. For instance, from this project even though most patients had low scores, around 53% (n=40) of patients reported feeling tired or had little energy for at least more than half the days during the previous two weeks and 44% (n=33) were having difficulties with sleep patterns for at least more than half the days during the previous two weeks. According to the collected data of 75 total patients, about 23 (31%) patients reported having somewhat difficulties in carried out activities of daily living, taking care of their household, and getting along with other people. The early identification of depressive symptoms not only benefits the patients, but also the care provider team, and the organization as a whole.

Ongoing monitoring is an important aspect for any new implementation/ QI process to be successful. During the ongoing monitoring, the clinic team should define, select, and monitor process measures to ensure that the intervention for reducing PSD is being carried out in a consistent manner according to intervention protocols. Also, the clinic staff should be collecting the data regarding the number of patients who missed screening, and the reason behind it for future improvements. There should be ongoing monitoring for the number of patients receiving treatment and follow ups for those that qualify.
References


doi:http://dx.doi.org/ju.idm.oclc.org/10.1371/journal.pone.0128246


### Appendix A

**PHQ-9 Patient Handout**

**Type of stroke:**

**Date of stroke:**

**Today’s Date:**

**Age:**

**Gender (circle):** Male  Female

**Over the last 2 weeks, how often have you been bothered by any of the following problems?**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Not at all (0)</th>
<th>Several days (1)</th>
<th>More than half the days (2)</th>
<th>Nearly every day (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Little interest or pleasure in doing things.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Feeling down, depressed, or hopeless.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Trouble falling/staying asleep, sleeping too much.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Feeling tired or having little energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Poor appetite or overeating.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Feeling bad about yourself, or that you are a failure, or have let yourself or your family down.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Trouble concentrating on things, such as reading the newspaper or watching TV.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Moving or speaking so slowly that other people could have noticed. Or the opposite; being so fidgety or restless that you have been moving around more than usual.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Thoughts that you would be better off dead or of hurting yourself in some way</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all ____

Somewhat difficult____

Very difficult___

Extremely difficult____

**Total Score______________** (MA completes)
Appendix B

- What changes need to be made to the next cycle?
- If no changes, roll out the improvement

- Set improvement goals
- Predict what will happen
- Plan the cycle (who, where, what and how)
  - Decide what data to gather

- Carry out the plan
- Document any problems encountered and observations
- Gather data

- Fully analyse data
- Compare data to predictions
- Examine learning
Appendix C
Appendix D

Physician PHQ-9 Interpretation and Intervention Checklist

➢ Final diagnosis should be made with clinical interview and mental status examination including assessment of patient’s level of distress and functional impairment noted on last question

➢ If patient endorsed questions 1 or 2 with a score of at least 2 or 3 AND for questions 1-8 has a total of 5 or more boxes with a score of 2 or 3 so that total score is 10 or more consider an intervention.

➢ Question 9 is a red flag for suicidality and needs further assessment.

➢ Physician please indicate what you did after reviewing the results of the PHQ-9:

- Low score less than 10 and no flags
  □ 1. No intervention required
  □ 2. Patient is already in treatment for depression and no further intervention

- Scored 10 – 14: provisional diagnosis may be a mild depression
  □ 3. Discussed with patient and no further intervention
  □ 4. Recommended referral to a mental health provider
  □ 5. Recommended antidepressant medication

- Scored 15 and higher: provisional diagnosis moderately severe to severe depression
  □ 6. Discussed with patient and no further intervention
  □ 7. Patient is already in treatment for depression
  □ 8. Recommended referral to a mental health provider
  □ 9. Recommended antidepressant medication
  □ 10. Recommended urgent psychiatric hospitalization

- Endorsed question 9 on suicidality for several days or more
  □ 11. Discussed with patient and no further intervention
  □ 12. Recommended referral to mental health provider
  □ 13. Recommended antidepressant medication
  □ 14. Recommended urgent psychiatric hospitalization
Appendix E

Project Timeline

<table>
<thead>
<tr>
<th>Task</th>
<th>Aug-Sep</th>
<th>Oct</th>
<th>Oct-Dec</th>
<th>Jan-May</th>
<th>May-June</th>
<th>July-Aug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet with key stakeholders</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training for staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposal presentation to JU committee</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>IRB approval process</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation period</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Gathering and compare</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>In depth analysis of results</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written documentation of project, evaluation, and interpretation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>submitted to appropriate agencies for approval</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Disseminations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
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### Table 1. Variables

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<thead>
<tr>
<th>Variable</th>
<th>Level of Measurement</th>
<th>Descriptive Statistical Procedures</th>
</tr>
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<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of stroke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of days since last stroke event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total PHQ-9 score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ-9 question #1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ-9 question #2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ-9 question #3</td>
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<tr>
<td>PHQ-9 question #4</td>
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<td></td>
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<tr>
<td>PHQ-9 question #5</td>
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<td></td>
</tr>
<tr>
<td>PHQ-9 question #6</td>
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<td></td>
</tr>
<tr>
<td>PHQ-9 question #7</td>
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<td></td>
</tr>
<tr>
<td>PHQ-9 question #8</td>
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</tr>
<tr>
<td>PHQ-9 question #9</td>
<td></td>
<td></td>
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<tr>
<td>Physician Intervention #</td>
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</tbody>
</table>
Appendix G

Table 1 Descriptive Statistics of PHQ-9 Patient Handout Survey Data

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%)</th>
<th>N = 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex [n (%)]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>35 (46.7)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40 (53.3)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>66.3 (13.60)</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>66.0</td>
<td></td>
</tr>
<tr>
<td>Min - Max</td>
<td>34.0 - 95.0</td>
<td></td>
</tr>
<tr>
<td>Little interest or pleasure in doing things</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>57 (76.0)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>8 (10.7)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>6 (8.0)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>4 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Feeling down, depressed, or hopeless</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>54 (72.0)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>8 (10.7)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>9 (12.0)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>4 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Trouble falling/staying asleep, sleeping too much</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>42 (56.0)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>16 (21.3)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>3 (4.0)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>14 (18.7)</td>
<td></td>
</tr>
<tr>
<td>Feeling tired or having little energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>35 (46.7)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>16 (21.3)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>3 (4.0)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>21 (28.0)</td>
<td></td>
</tr>
<tr>
<td>Poor appetite or overeating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>64 (85.3)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>2 (2.7)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>4 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>5 (6.7)</td>
<td></td>
</tr>
<tr>
<td>Feeling bad about yourself, or that you are a failure, or have let yourself or your family down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>54 (72.0)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>13 (17.3)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>4 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>4 (5.3)</td>
<td></td>
</tr>
</tbody>
</table>

SD = Standard Deviation, Min = Minimum, Max = Maximum, N: Number of patients, % = 100 x (n/N)
Table 1 Descriptive Statistics of PHQ-9 Patient Handout Survey Data

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%)</th>
<th>N = 75</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trouble concentrating on things, such as reading the newspaper or watching TV</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>54 (72.0)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>9 (12.0)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>4 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>8 (10.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Moving or speaking so slowly that other people could have noticed. Or the opposite; being so fidgety or restless that you have been moving around more</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>61 (81.3)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>6 (8.0)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>3 (4.0)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>5 (6.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Thoughts that you would be better off dead or of hurting yourself in some way</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>72 (96.0)</td>
<td></td>
</tr>
<tr>
<td>Several days</td>
<td>2 (2.7)</td>
<td></td>
</tr>
<tr>
<td>More than half days</td>
<td>1 (1.3)</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Difficulty level of endorsed problems in work, at home, and with people</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not difficult at all</td>
<td>52 (69.3)</td>
<td></td>
</tr>
<tr>
<td>Somewhat difficult</td>
<td>19 (25.3)</td>
<td></td>
</tr>
<tr>
<td>Very difficult</td>
<td>3 (4.1)</td>
<td></td>
</tr>
<tr>
<td>Extremely difficult</td>
<td>1 (1.3)</td>
<td></td>
</tr>
</tbody>
</table>

SD = Standard Deviation, Min = Minimum, Max = Maximum, N: Number of patients, % = 100 x (n/N)
<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%)</th>
<th>N = 75</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHQ-9 Score</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td></td>
<td>4.7 (5.34)</td>
</tr>
<tr>
<td>Median</td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td>Min - Max</td>
<td></td>
<td>0.0 - 21.0</td>
</tr>
<tr>
<td><strong>PHQ-9 Score [n (%)]</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10</td>
<td></td>
<td>63 (84)</td>
</tr>
<tr>
<td>10 - 14</td>
<td></td>
<td>5 (6.7)</td>
</tr>
<tr>
<td>15 or more</td>
<td></td>
<td>7 (9.3)</td>
</tr>
<tr>
<td><strong>Physician Intervention [n (%)]</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No intervention required</td>
<td></td>
<td>61 (81.3)</td>
</tr>
<tr>
<td>Patient is already in treatment for depression and no further intervention</td>
<td></td>
<td>4 (5.3)</td>
</tr>
<tr>
<td>Discussed with patient and no further intervention</td>
<td></td>
<td>14 (16.0)</td>
</tr>
<tr>
<td>Recommended referral to a mental health provider</td>
<td></td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Recommended antidepressant medication</td>
<td></td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Recommended urgent psychiatric hospitalization</td>
<td></td>
<td>0 (0.0)</td>
</tr>
</tbody>
</table>

SD = Standard Deviation, Min = Minimum, Max = Maximum, N: Number of patients, % =100 x (n/N)
Appendix H

### Distribution of Response by Question

<table>
<thead>
<tr>
<th>PHQ-9 Question</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>100</td>
</tr>
</tbody>
</table>

**Response**
- Not at all
- Several days
- More than half days
- Nearly every day

The chart shows the distribution of responses for each PHQ-9 question, with the percentage of respondents indicating each response option.
PHQ-9 - Little interest or pleasure in doing things

- Not at all: 76.0%
- Several days: 10.7%
- More than half days: 8.0%
- Nearly every day: 5.3%
PHQ-9 - Feeling down, depressed, or hopeless

- Not at all: 72.0%
- Several days: 10.7%
- More than half days: 12.0%
- Nearly every day: 5.3%
PHQ-9 - Trouble falling/staying asleep, sleeping too much

- Not at all: 56.0%
- Several days: 21.3%
- More than half days: 4.0%
- Nearly every day: 18.7%
PHQ-9 - Feeling tired or having little energy

Percent (%)

Not at all: 46.7%
Several days: 21.3%
More than half days: 4.0%
Nearly every day: 28.0%
PHQ-9 - Poor appetite or overeating

- Not at all: 85.3%
- Several days: 2.7%
- More than half days: 5.3%
- Nearly every day: 6.7%
PHQ-9 - Feeling bad about yourself, or that you are a failure, or have let yourself or your family down

Percent (%)
Not at all | Several days | More than half days | Nearly every day
---|---|---|---
73.0 | 17.6 | 4.1 | 5.4
PHQ-9 - Trouble concentrating on things, such as reading the newspaper or watching TV

- Not at all: 72.0%
- Several days: 12.0%
- More than half days: 5.3%
- Nearly every day: 10.7%
PHQ-9 - Moving or speaking so slowly that other people could have noticed. Or the opposite; being so fidgety or restless that you have been moving around more than usual.
PHQ-9 - Thoughts that you would be better off dead or of hurting yourself in some way

- Not at all: 96.0%
- Several days: 2.7%
- More than half days: 1.3%