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Development and Evaluation of Nurse Leader Directed Depression Screening Program in an Adult Primary Care Practice

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ABSTRACT

Depression is the chief source of infirmity in the United States for people between the ages of 15 and 44 years. In the United States, 17 million people, or 7% of the adult population, experience at least one depressive episode in their lifetime. Untreated depression causes emotional anguish, diminished efficiency in the workforce, missing wages, compromised relationships, and an increased risk of comorbidities such as diabetes, hypertension, stroke, heart disease, and cancer. The depression screening rate occurring nationally in primary care offices among adults 18 years or older is 1.4%–2.2%. The DNP project aimed to increase depression screening rates in an adult primary care clinic by embedding the PHQ–9 depression screening into the clinic's electronic health record. A Plan-Do-Study-Act cycle (PDSA) was used to evaluate the project over two periods: week three and at the conclusion of the project. A two-tailed independent samples t-test was performed to assess whether the mean of the pre-intervention screening and the post-intervention screening was significantly distinct. Also, a two-tailed Mann-Whitney two-sample rank-sum test was performed to assess whether there were substantial variations between the pre-intervention screening and the post-intervention screening. The DNP project found that embedding a depression screening tool such as the PHQ-9 in the electronic health records (EHR) of a

primary care clinic increased the participation in depression screening programs by providers and patients. Also, the depression screening program increased the number of patients screened and referred for treatment. The DNP project further substantiated what is found in the literature: that EHR-embedded PHQ-9 will help with the diagnosis and treatment of mental health disorders such as depression.

Keywords: adults, depression, depression screening, PHQ–9, primary care and clinic, electronic health records

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Depression is a disease that can happen at any point in the human lifespan. In the United States (U.S.), depression is the leading cause of infirmity in individuals between 15 and 44 years (Siniscalchi et al., 2020). An estimated 21 million adults in the U.S. have had at least one major depressive episode in their lifetime, representing 8.4% of all U.S. adults (National Institute of Mental Health, 2022; Substance Abuse and Mental Health Services Administration, 2022). Of those with depression, 14.7% or 3.7 million people had depression with severe impairment (Substance Abuse and Mental Health Services Administration, 2022).

In 2015, depressive disorders were the third foremost reason for disability globally (Park & Zarate, 2019). In the U.S., the assessed lifetime danger of a major depressive episode is 30% (Park & Zarate, 2019). In addition to the high incidence of depression, several risk factors and comorbid chronic medical conditions including diabetes, cardiovascular disease, obesity, and an individual or family history of major depressive disorder (MDD) increase the incidence and mortality of depression (McCarron et al., 202; Zhao et al, 2025). Apart from the risk factors and comorbid conditions above, societal and cultural factors such as socioeconomic status (SES), can contribute to depression (Malhi & Mann, 2018; Schlax et al., 2019). Inequities due to SES lead to higher incidences of cardiovascular disease, diabetes, and depression, which often have negative outcomes due to difficulties in accessing care (Schlax et al., 2019).

The prevalence of a major depressive episode is more significant amongst adult females (10.5%) compared to males (6.2%) (National Institute of Mental Health [NIMH], 2022). The frequency of adults with a major depressive episode is most significant among 18–25-year-olds (17.0%) (NIMH, 2022). Among racial groups, the incidence of a major depressive episode is most significant (15.9%) among those who describe being of multiple (two or more) races (NIMH, 2022). Nearly 66% of people who identify as lesbian, gay, bisexual, transsexual, queer, intersex, and asexual (LGBTQIA+) have depressive thoughts

to some degree—a rate that is 21% higher than those who do not identify as LGBTQIA+ (HelpAdvisor.com, 2022; U.S. Census Bureau, 2022).

Nationally, more than 20% of people who identify as LGBTQIA+ experience feelings of depression almost every day (HelpAdvisor.com, 2022; U.S. Census Bureau, 2022). Similarly, individuals of a lower socioeconomic status, as determined by education, occupation, and income, are associated with a higher risk of depression (Hobel et al., 2017; Hudson, 2005). In a correlation study that examined 34,000 patients with two or more psychiatric hospitalizations in the state of Massachusetts from 1994 to 2000, economic stressors and lower economic status related to unemployment, poverty, and housing unaffordability were found to be correlated with an increased risk of mental illness (Hudson, 2005).

In addition to SES, the type of medical insurance coverage can impact depression (Centers for Medicare and Medicaid Services [CMS], 2021). The Centers for Medicare & Medicaid Services state that 18.4% of all Medicare fee-for-service (FFS) beneficiaries had a diagnosis of depression in 2018 (CMS, 2021). Prevalence is greater among dual-qualified beneficiaries, both Medicare and Medicaid (31.3%), than single-eligible beneficiaries (15.2%) (CMS, 2021). Regardless of gender, race, sexual identification, and socioeconomic status, depression significantly impacts this demographic.

Depression costs the U.S. economy approximately $210 billion yearly, secondary to lost productivity in the workplace owing to medical treatment for depression (Siniscalchi et al., 2020). Untreated depression causes emotional anguish, diminished efficiency in the workforce, missed wages, compromised relationships, and an increased risk of comorbidities such as diabetes, hypertension, stroke, heart disease, and cancer (Office of Disease Prevention and Health Promotion, 2019; Siniscalchi et al., 2020). Only 37% of the total expenses of significant depression were attributable to the illness itself; the remaining 62% were sustained from direct and indirect costs associated with co-occurring illnesses (Greenberg et al., 2021). These co-occurring illnesses include adjustment disorder, posttraumatic stress disorder, anxiety disorders, and non-psychiatric disorders, such as chronic pain and sleep disturbance (Greenberg et al., 2021). For every dollar spent on direct costs of depression, an additional US $2.30 was spent on indirect costs of depression, and another US $5.61 was spent on indirect and direct comorbidity costs. These results are in line with the research literature demonstrating that integrative and collaborative care should continue to be favored to lower the economic burden of adults with MDD (Greenberg et al., 2021; Birk et al., 2019). The high cost of depression and associated comorbidities make it a threat not only to the health of the nation but to its economy as well (Greenberg et al., 2021; Birk et al., 2019). Depression's impact on the economy, as demonstrated by the cost to employers for workdays attributed to depression, is as great, or greater than, the cost created by other chronic diseases such as heart disease, diabetes, or back problems (Greenberg et al., 2021; Birk et al., 2019). This illustrates the societal burden of depression compared to other chronic diseases (Greenberg et al., 2021; Birk et al., 2019).

Due to the negative impact of depression on individuals, families, companies, and society, it is commonly seen among patients pursuing care in the primary care setting.
The United States Preventive Task Force (USPTF) recommends universal screening for depression in the common adult population over 18, including pregnant and postpartum women (United States Preventive Services Task Force, 2022). In addition to the USPTF, the American Academy of Family Physicians endorses screening for depression in the

general adult population over 18 (Maurer et al., 2018). The USPTF also recommends depression screening tools that effectively identify depression, such as the Patient Health Questionnaire-9 (PHQ-9) (United States Preventive Services Task Force, 2022).
Additionally, the USPTF states that depression screening should be executed with support to guarantee correct diagnosis, successful treatment, and suitable follow–up (United States Preventive Services Task Force, 2022).

Policy improvements have precisely steered the advancement of uniform screening for mental health in primary care settings (Mulvaney-Day et al., 2018). Although the cost of depression is high, the government and private industry have implemented value-based payment models for medical providers to encourage a more well-rounded approach to delivering mental health care (Mulvaney-Day et al., 2018). Recent compensation models, such as the Medicare Shared Savings Program, require mental health screenings, such as depression screenings, to receive shared savings or financial incentives (Mulvaney-Day et al., 2018). This change has incentivized organizations to invest in essential infrastructure modifications (Mulvaney-Day et al.,2018). The latest reforms strengthen USPTF-recommended depression screening that promotes early identification and treatment (Mulvaney-Day et al., 2018). The Centers for Medicare and Medicaid Services (CMS) now necessitates that accountable care organizations (ACOs) assess 12–month depression remission rates to meet quality performance guidelines for collective financial savings through programs such as the shared savings model (Mulvaney-Day et al., 2018). Similar trends in the delivery and funding of clinical care have led to an expanded interest in recognizing mental health disorders such as depression in primary care practices (Mulvaney-Day et al., 2018).

Despite these recommendations, economic programs, and incentives, most primary care practices do not screen for depression (Siniscalchi et al., 2020; Stryd et al., 2026). My proposed DNP project will take place in an adult primary care clinic located in the suburbs of Baltimore, Maryland. Although the proposed project site has a depression screening protocol using a paper PHQ-9 that is manually administered by the provider and scanned in the chart after the patient visit, it captures an insufficient number of patients that present to the clinic. The clinic has a screening rate of 29.8%, which is less than the USPTF recommendations of 100% screening on all adult patients (U.S. Preventative Services Task Force, 2022).

Rationale

Currently, 50% of patients with depression evaluated in any medical setting are not recognized as having depression, and only 22% receive adequate treatment (Jha et al., 2019). In 2009 and 2016, the USPTF recommended universal screening for depression in all adult patients in the primary care setting, which is currently not standard practice in most primary care settings (Park et al., 2019; U.S. Preventative Services Task Force, 2022; US Preventive Services Task Force, 2023). The depression screening rate occurring nationally in primary care offices among adults 18 years or older is 1.4% to 2.2% (Siniscalchi et al., 2020). The Doctor of Nursing Practice (DNP) project instituted a depression screening program using the electronic health record (EHR) instead of paper. Although the local clinic had a depression screening protocol, it captured an insufficient number of patients that presented to the clinic. The clinic had a screening rate that is lower

than the USPTF recommendation of 100% screening for all adult patients. This DNP project aimed to increase the number of patients screened for depression at a local clinical by implementing the PHQ-9 depression screening into the clinic's EHR system (Siniscalchi et al., 2020).

Specific Aims

In the research literature, depression screening in primary care sites was found to enhance the quality of life, limit healthcare costs, and decrease barriers from co-occurring illnesses (Mulvaney-Day et al., 2017). The USPTF endorses 100% screening for depression in all adult patients in the primary care setting; however, less than 3% of primary care practices in the U.S. screen for depression (Park et al., 2019). The site of my DNP project had a depression screening program. However, the PHQ-9 screening tool was on paper and not part of the EHR, and this was a significant barrier to diagnosis. The proposed intervention sought to reduce this barrier by adding the PHQ-9 to the EHR.

A Population, Intervention, Comparison, Outcome, and Time (PICOT) question was formed to guide and examine the proposed intervention. The PICOT question was: Among adult patients at a private primary care practice, how does a depression screening tool integrated into the EHR influence the rate of screening over a six-week period when compared with current practice?

LITERATURE REVIEW

Demographics

Even though national recommendations are that all adults over the age of 18 are to be screened for depression, over 50% of Americans do not have their depression needs evaluated (Kato et al., 2018). Specific populations are more likely to be missed for depression due to a lack of depression screening, and those populations include men, people over 75 years old, ethnic minorities, and the uninsured (Kato et al., 2018). When examining gender differences in depression, diagnosis peaked in adolescence but remained stable during adulthood, with the burden of depression being greater in females than in males (Salk et al., 2017). In the U.S., the differences among ethnic groups were not significant. Also, gender differences were the smallest among African Americans (Salk et al., 2017). However, when examining the racial difference in screening, African Americans were 50% less likely to be screened than Caucasian Americans (Akincigil & Matthews, 2017). Similarly, the geriatric population was 50% less likely to be screened than the middle-aged population (Akincigil & Matthews, 2017). Generally, rates of depression screening were low among minorities and the geriatric population as compared with the national average (Akincigil & Matthews, 2017; Blackstone et al., 2022;Johnson et al., 2025). Existing depression screening practices in healthcare explain this difference and may widen current gaps in depression treatment (Akincigil & Matthews, 2017).

Preventative interventions for depression, such as screening, are vital to closing the existing health disparities; however, there is mixed data concerning the success of screening and

referral programs due to impediments such as a successful referral of patients to mental health providers caused by provider shortages (Blackstone et al., 2022; Salk et al., 2017).

Screening

In a systematic review, depression screening was found to enhance the recognition and identification of depression in the primary care setting using tools such as the PHQ-9, Beyond Blue or World Health Organization (WHO) 5-item depression questionnaire, Beck Depression Inventory, version 2 (BDI-II) or Geriatric Depression Scale (GDS) (Miller et al., 2020). Furthermore, depression screening increases the number of mental health treatment referrals, the incidence of moderate to severe depression symptoms identified, and mental health disorders identified (Miller et al., 2020). In a retrospective study using the PHQ-9, 400 EHRs were reviewed across two primary care clinics. Researchers concluded that screening for depression led to a 41% increase in diagnoses of depression after the depression screening program is implemented (Randle et al., 2019). Additionally, researchers found the depression screening program in the primary care setting was thought to increase positive outcomes in patients with comorbid conditions such as hypertension and diabetes (Randle et al., 2019). In a New York City microsimulation probing the efficacy of universal PHQ-2 and PHQ-9 screening— followed by collaborative care for those who screened positive—depression screening programs were found to be effective and cost-efficient in reducing healthcare costs related to depression (Jiao et al., 2017). Additionally, a retrospective study of a screening program using the PHQ-2 and PHQ-9 in 10 clinics and involving 25,369 eligible patients found depression screening programs have proven to lead to increased access to care and reduced health disparities (Thompson et al., 2019). However, positive clinical outcomes are only increased if screening happens when sufficient care and support structures are in place to ensure the correct identification of depression and follow-up therapy or medication treatment (Miller et al., 2020). Also, a statistically substantial reduction in self-reported depression results—from screening to follow-up—when a depression screening program is implemented (Siniscalchi et al., 2020).

In a cross-sectional study using data from the National Ambulatory Medical Care Survey (2005–2015), found detecting depression among adults during screening in primary care settings, accompanied by treatment, usually helps lower morbidity (Bhattacharjee et al., 2018; Center for Disease Control, 2018). The research literature states the national-level depression screening percentage is 1.4% percent of all adult primary care visits (Bhattacharjee et al., 2018; Siniscalchi et al., 2020). A significant rise in depression screening rates post-2009 was likely prompted by the Affordable Care Act of 2010, which included the requirement for preventative care, such as depression screening, at no expense to patients (Bhattacharjee et al., 2018; Coombs et al, 2021).

However, there was reduced depression screening in rural communities versus larger urban areas (Bhattacharjee et al., 2018; Morales et al., 2020). The adverse outcomes from depression that remain undiagnosed include functional disability, boosted healthcare costs, and elevated risk of morbidity and mortality (Bhattacharjee et al., 2018; Siniscalchi et al., 2020).

Screening Tools

Growing evidence shows that early recognition of and treatment for behavioral health disorders can help prevent complications, improve quality of life, and reduce healthcare costs (Mulvaney-Day et el., 2017). Screening tools are recommended to be used in the primary care setting for the early recognition and treatment of behavioral health disorders (Mulvaney-Day et el., 2017; United States Preventive Services Task Force, 2022) When examining the power of a behavioral health screening tool's authentication, it must use three measures: "(1) whether a strong gold standard (e.g., a clinical interview) was used, (2) whether the scale's sensitivity and specificity had been tested in primary care settings, and (3) whether the scale's sensitivity and specificity both exceeded 75% (considered good or excellent according to the generally–accepted rule of thumb)" (Mulvaney-Day et al., 2017, p. 2). The findings concluded that the PHQ-9 had a sensitivity and specificity of 88%, which was the highest of all behavioral health screening tools analyzed (Mulvaney-Day et al., 2017). Additionally, the PHQ-9 has been with a "range from 0.37 to 0.98, the specificity ranged from 0.42 to 0.99, the positive predictive value ranged from 0.09 to 0.92, and the negative predictive value ranged from 0.8 to 1" (Costantini et al., 2021, pg. 1), which further strengthen its status as the excellent tool to for diagnosis of depression.

The PHQ-9 has been evaluated extensively for depression screening (Costantini et al., 2021). The PHQ-9 was also endorsed by the National Quality Forum (NQF) for behavioral health screening (Mulvaney-Day et el., 2017). It is widely validated as a screening tool in primary care services in different countries, and its psychometric reliability has been established (Costantini et al., 2021). The PHQ-9 is the recommended screening tool for depression screening in primary care (Costantini et al., 2021).
Similarly, the PHQ-9 was the most common depression screening tool used by the providers (Miller et al., 2020). The simplicity of use was the most popular reason for its use as compared to other screening tools (Miller et al., 2020). Digital implementation was found to be the best and most straightforward way to administer PHQ-9 (Costantini et al., 2021). Also, the PHQ-9's administration is compensated by Medicare, Medicaid, and commercial medical insurance. The PHQ-9 was found to be the most reliable tool for screening depression (Mulvaney-Day et al., 2017).

Although PHQ-9 has been an effective tool in depression screening, depression screening using the PHQ-9 can be challenging within primary care settings (Pilipenko & Vivar–Ramon, 2020). It was found to be suboptimal because participants screened with the PHQ-9 stated not having their screening scores explained by clinic staff by as much as 50% in a survey study of 100 participants (Pilipenko & Vivar–Ramon, 2020).
Similarly, as many as 20% of participants who were screened with the PHQ-9 reported that depression was not discussed in their care (Pilipenko & Vivar–Ramon, 2020).

Integration of Depression Screening Tool in the EHR

Information technology can help the efficacy of depression screening tools by inserting those tools in the vital sign documentation, allowing staff to enter the patient's answers regarding depression into the EHR and making the process more seamless (Savoy & O'Gurek, 2016). Since the research literature concluded primary care is an ideal setting

for identifying, diagnosing, and treating depression, depression screening via the EHR in a primary care setting would aid in this effort (Aalsma et al., 2018). In a prospective cohort study, 2,038 participants in a pediatric primary care clinic used a computer-based PHQ-9 administration, a depression screening tool, because it is thought to be more effective than traditional methods (Aalsma et al., 2018). The computer-based delivery was found to be the best practice and sustainable for a depression screening program in a primary care setting (Aalsma et al., 2018). It was found to have a 20% screened positive rate for depression, which aligns with current research literature (Aalsma et al., 2018). Also, a retrospective study using a descriptive convenience cohort found depression screening tools embedded in the EHR are functional for depression screening, and an entrenched screening tool is received and used by physicians, patients, and clinic staff based upon 866 encounters (Burdick & Kessler, 2017). Also, embedded screening tools were found to impact providers' decisions more positively than negatively because of patients' higher rates of positive depression screens (Bayer et al., 2026; Burdick & Kessler, 2017).

Quality of life

More than 260 million individuals worldwide are affected by depression, which is a primary cause of disability (Costantini et al., 2021). The number of all-age years lived with disability (YLDs) is comparable to one complete year of healthy life missed due to disability or ill-health, expanded to 14% percent (Costantini et al., 2021). Depressive disorders affected the loss of an overall age-adjusted rate of 526 per 100,000 disability-adjusted life years (DALYs), which is a gauge of overall illness burden (Costantini et al., 2021). The most important contributor to decreased DALY, which is conveyed as the number of years missed due to ill-health, disability, or early death, is mental and behavioral illnesses (Costantini et al., 2021). Decreased educational accomplishments, inadequate financial attainment and role execution, a greater number of days out of work, and raised risk of job loss correspond to the social and financial cost social expenditures of depression (Costantini et al., 2021). Early identification positively impacts the outcome of treatment, decreases the incidence of setbacks, and normally leads to greater quality of life (Costantini et al., 2021).

One-time depression screening was found to have an expense–value ratio of just more than $45,000 for each quality-adjusted life year (QALY) gained (Smithson & Pignone, 2017). Over the lifetime of an individual, this is an exceptional cost savings to the healthcare system when screening is begun in the primary care setting (Smithson & Pignone, 2017). Similarly, the incremental cost-effectiveness of depression screening as an intervention over the average lifespan of a 20-year-old adult is an increase of approximately 1,726 QALY. (Jiao et al, 2017). This has a 95% conceivable interval cost reduction of 10,594 QALY achieved (Jiao et al, 2017). This was found to be most accurate when using a two-stage depression screening—PHQ-2 followed by a PHQ-9—combined with cooperative care for depression in the clinical location and seems to be less costly than most clinical preventative interventions in high-risk patients (Jiao et al, 2017)

METHOD

The project occurred in a local clinic which sees approximately 5,000 patients yearly (Summit Medical Group, 2023). The clinic's population is diverse, representing 114 countries around the world apart from the United States (Summit Medical Group, 2023). The clinic has an insurance mix of Medicare, Medicaid, and private insurance (Summit Medical Group, 2023). The clinic has eight physicians, three nurse practitioners, including a psychiatric nurse practitioner, three medical scribes, five medical assistants, and three administrative staff (Summit Medical Group, 2023).

The clinic had a depression screening protocol; however, it captured an insufficient number of patients that are present in the clinic. The clinical practice for depression screening in the clinic was for the patient to be provided with the paper PHQ-9 to fill out before the wellness visit. The paper PHQ-9 was reviewed with the provider during the visit. If the patient didn't fill out the PHQ-9, the provider asked questions on the PHQ-9 and the medical scribe documented the patient responses on a paper. The paper PHQ-9 was placed in the chart and returned to the front desk after the wellness visit. The paper PHQ-9 was scanned into the chart. Unfortunately, however, the PHQ-9 was not always scanned into the chart after the wellness visit. The goal of the project was to increase the number of patients screened for depression at the clinic with the implementation of the PHQ-9 depression screening embedded into the clinic's EHR. The PHQ-9 is a statistically valid, dependable, and free tool used for the psychological screening of depression (Mulvaney-Day et el., 2017).

Participants

The project participants were all chosen by visit type. The inclusion criteria were any patient 18 years and above who visited the clinic for a wellness visit. The exclusion criteria were any patient who was not 18 years old and above or did not come to the clinic for a wellness visit.

Interventions

During the DNP project, a pre-intervention and post-intervention design was used. Pre-intervention data from the electronic medical record (EMR) was gathered by the DNP project leader and informaticist and reviewed by the DNP project leader. The DNP project leader examined the information in the EMR over a six-week timeframe to extract data about patients during their wellness visits and whether they were screened using the depression screening tool. Additionally, demographic data was attained, which included details about an individual's age, gender, and insurance status based on International Statistical Classification of Diseases and Related Health Problems, 10th revision's (ICD-10) codes of Z00.00 (wellness visit without abnormal findings) and Z00.01 (wellness visit with abnormal findings). The data from the EMR were assessed to determine if the patient was screened for depression and referred for treatment.

DNP project stakeholders included the clinic's medical director, providers, IT support, medical scribes, medical assistants, and administrative staff. Before the project

was implemented, the DNP project leader, the medical director, the providers, the clinic informaticist, and the DNP project mentor met to discuss the PHQ-9 being transitioned from paper, and where it would be located in the EHR. It was decided that the PHQ-9 would be embedded in a tab on the assessment section of the provider's screening section of the EHR. Before the DNP project was implemented, the providers, medical scribes, medical assistants, and administrative staff were educated about the PHQ-9 being transitioned from paper to the EHR. Once the intervention commenced, the PHQ-9 was completed in the EMR by the provider and medical scribe during the wellness visit.

Intervention Implementation

During the first week of implementation, the scribes and providers were oriented using the PHQ-9 embedded in the EHR. The most significant barrier during the first week was showing the providers and medical scribes the location of the embedded PHQ- 9. The DNP project leader also met with the providers and medical scribes to discuss any barriers encountered during the first week. The DNP project leader decided during the first week to continue meeting with the providers to ascertain if the new process was helpful and if any barriers to implementation existed. The providers and scribes indicated the PHQ-9 placement was awkward for their documentation flow. The DNP project leader discussed with the medical director and informaticist about placing the PHQ-9 in a new area based on their recommendation. The DNP project leader continued to meet with the provider, medical scribes, and staff during the project. The PHQ-9 was embedded in the new area by week three of the project. The DNP project leader continued to meet with the provider and medical scribes to evaluate the project. The project leader used a PDSA cycle to evaluate the project. The DNP project was evaluated over two periods. The periods were at week three and at the conclusion of the project.

Measures

The PHQ-9 was used as the screening tool during this project. The PHQ-9 scores "each of the 9 DSM-IV criteria as '0' (not at all) to '3' (nearly every day)" (Kroenke et al., (2001). As a measurement of the severity of depression, the PHQ-9 score can range from "0 to 27, as each of the 9 items can be marked from 0 (not at all) to 3 (nearly every day" (Kroenke et al., (2001). PHQ-9 is scored, representing different types of depression. They are mild, moderate, moderately severe, and severe depression, with scores of 5, 10, 15, and 20, correspondingly (Kroenke et al., (2001). The PHQ-9 score ≥10 indicated major depression with a sensitivity of 88% and a specificity of 88% for major depression (Kroenke et al., (2001).

Data were collected for this project from July 5, 2022, to August 28, 2022. The PHQ-9 was used as a screening tool for depression for patients over 18 during a wellness exam. The post-intervention data was gathered by the informaticist and DNP project leader using the same information collected during the pre-intervention review.

The DNP project leader developed a codebook for this DNP project as a data collection tool. In the codebook, the DNP project leader collected information about the patient's gender, age, insurance status, PHQ-9 screening, PHQ-9 scores, and referral for treatment. The data gathered during the DNP project based on the codebook was entered

into a spreadsheet. Data from the spreadsheet was then entered into Intellectus Statistics for analysis.

Analysis

For this DNP project, the independent variable was the PHQ-9 imbedded in the EHR (Bhandari, 2022). The dependent variable for this project was the rate of patients screened for depression (Bhandari, 2022). The project variables were nominal. The variables were the patients screened and not screened for depression using the PHQ-9. The demographic variables were age, gender, race, and type of insurance. The data was analyzed using the means for each type of data. The data were pulled from the EHR by the informaticist. The data was analyzed using Intellectus Statistics. The means data from the pre-intervention and post-intervention screening rates will be compared. PHQ-9 scores were based upon answers to questions by the patients during the DNP project (Kroenke et al., 2001). The scores represented a different type of depression (Kroenke et al., 2001). The PHQ-9 scores and their correspondence to mild, moderate, moderately severe, and severe depression were discussed above (Kroenke et al., (2001). The provider assessed the patient using their score on the PHQ-9 and decided if the patient was referred to treatment. The treatment options were therapy, medicine, or both. The data from the PHQ-9 scores and referral to treatment were collected and analyzed. The scores from the pre-intervention and post-intervention screenings, as well as referrals were compared.

To assess whether the mean of the pre-intervention screening and the post-intervention screening was significantly distinct, a two-tailed independent samples t-test was performed (Intellectus Statistics, 2022) A two-tailed independent samples t-test assumes "the independence of the observations and that each subject should only belong to one group" (Data Novia, 2021). Similarly, it also assumes "there is no relationship between the observations in each group" (Data Novia, 2021). The statistician from Intellectus Statistics was consulted for accuracy. The effect size told me how much of an impact the intervention was having on the study population (Sullivan, 2012). This was important when understanding clinical significance about whether the new intervention will have more clinic patients screened for depression and referred for treatment (Sullivan, 2012).

RESULTS

The DNP project was conducted to evaluate if the depression screening rates would increase with the implementation of a PHQ-9 embedded in the EHR versus a paper PHQ-9. The project was implemented in a suburban primary care practice. A retrospective chart review was conducted six weeks prior to the initiation of the EHR-embedded PHQ-9 depression screening tool for adult patients scheduled for a wellness visit. The charts were evaluated for the depression screening, the PHQ-9 scores, gender, age, and referral for treatment.

Following the pre-intervention evaluation, the PHQ-9 was given to adults who presented to the clinic for a wellness visit. The PHQ-9 was administered over seven weeks between July 5, 2022, and August 28, 2022, secondary to technical difficulties with the

embedded EHR the first week. The identical data were examined for both pre-intervention screening and post-intervention screening groups.

Sample Characteristics

In the project, all participants were adults over the age of 18. The distribution of gender, health insurance, screening rates, and referrals for treatment in the pre-intervention screening and post-intervention screening samples are seen in Table 1 and Table 2. In the pre-intervention group, there were 57 adults, of which 36.8% were men and 63.2% were women. In the post-intervention group, there were 89 adults, of which 33.7% were men and 66.3% were women. Among the pre-intervention group, 94.7% were insured, and 5.3% were self–pay. Of those with insurance, 3.5% had Medicare, 29.8% had Medicaid, and 61.4% had private insurance. In the post-intervention group, 100% of the patients had insurance, with 21.3% using Medicaid and 78.7% using private insurance. In the pre-intervention screening group, 29.8% completed the screening, versus 75.28% in the post-intervention screening group. From this, among the participants who completed the screening, 1.75% in the pre-intervention group were referred to treatment, and 8.71% in the post-intervention group were referred to treatment.

Table 1

Frequency Table for Pre and Post PHQ-9 Screening Intervention Variables of Gender and Health Insurance

Variable	*n*	*%*
Pre-intervention Gender		
Male	21	36.8
Female	36	63.2
Post-intervention Gender		
Male	30	33.71
Female	59	66.29
Pre-intervention Health Insurance		
Medicare	2	3.5
Medicaid	17	29.8
Private	35	61.4
None	3	5.3
Post-intervention Health Insurance		
Medicaid	19	21.35
Private	70	78.65

Note. Due to rounding errors, percentages may not equal 100%.

TABLE 2

Frequency Table for PHQ-9 Screening Intervention Variables for Screening and Referrals for Treatment

Variable	*n*	*%*
Pre-intervention Screening		
Yes	17	29.8
No	40	71.2
Post-intervention Screening		
Yes	67	75.28
No	22	24.72
Pre-intervention Referrals for treatment		
Yes	1	1.75
No	56	98.25
Post-intervention Referrals for treatment		
Yes	8	8.91
No	81	91.09

Note. Due to rounding errors, percentages may not equal 100%.

During the intervention, there was an almost three-fold increase in the completed PHQ-9 screenings rates—75.28% in the post-intervention screening group versus 29.8% in the pre-intervention screening group, as seen in Figure 1 and Figure 2. Similarly, there was a four-fold increase of patients referred for treatment—1.75% in the pre-intervention group as compared to 8.71% in the post-intervention group. The post-intervention group was 36% larger than the pre-intervention group, so that could account for part of the increase in screening rates and referrals for treatment. The results reinforced that depression screening increases the identification of depression and leads to an increase in the number of mental health treatment referrals (Miller et al., 2020). The results also reinforce that a computer-based PHQ-9 administration is more effective than traditional methods. (Aalsma et al., 2018).

Figure 1.

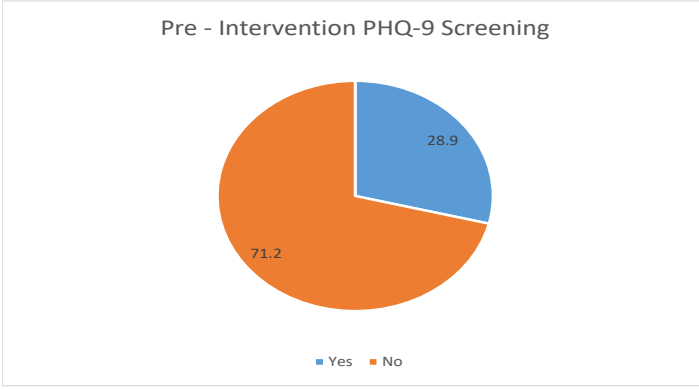
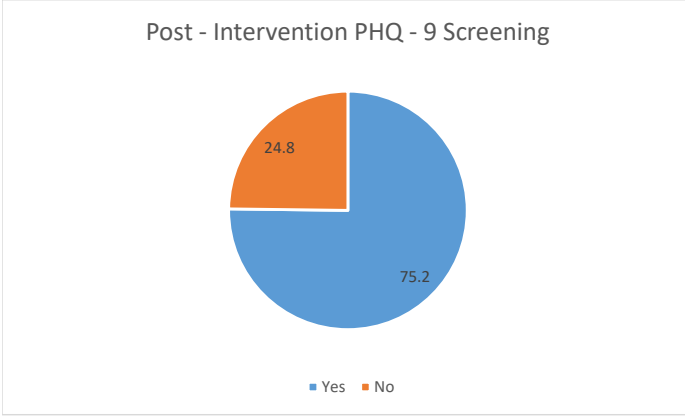


Figure 2.



Two-Tailed Independent Samples t-Test

To assess whether the mean of the pre-intervention screening and the post-intervention screening was significantly distinct, a two-tailed independent samples t-test was performed (Intellectus Statistics, 2022). The result of the two-tailed independent samples t-test found that there was significance based on an alpha value of 0.05, t(144) =

6.02, p < .001. This result implies the mean of the pre-intervention screening group, and the post-intervention screening group were substantially distinct. The findings are shown in Table 3.

TABLE 3

Two-Tailed Independent Samples t-Test for PHQ-9 Screening Pre-and Post- by Time

Variable	PRE		POST				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*
The Pre-intervention Screening and the Post-intervention Screening	1.70	0.46	1.25	0.43	6.02	<.001	1.01

Note. N = 146. Degrees of Freedom for the *t*-statistic = 144. *d* represents Cohen's *d.*

Two-Tailed Mann-Whitney U Test

Additionally, to assess whether there were substantial variations between the pre-intervention screening and the post-intervention screening, a two-tailed Mann-Whitney two-sample rank-sum test was done (Intellectus Statistics, 2022). This test is an alternative to the independent samples t-test. It does not have the same assumptions as an independent sample t-test (Intellectus Statistics, 2022). The outcome of the two-tailed Mann-Whitney U test was substantial based on an alpha value of 0.05, U = 3689.5, z = - 5.40, p < .001. This result indicates the distribution of the pre-intervention screening and the post-intervention screening for the group. Pre-intervention screening was considerably distinct from the distribution of the post-intervention screening group. There were 57 observations in the pre-intervention screening group and 89 observations in the post-intervention screening group. Table 4 presents the result of the two-tailed Mann-Whitney U test.

TABLE 4

Two-Tailed Mann-Whitney Test for PHQ_9_Screening_Pre_and_Post by Time

Variable	Mean Rank		*U*	*z*	*p*
	PRE	POST			
PHQ_9_Screening_Pre_and_Post	93.73	60.54	3,689.50	-5.40	< .001

The strengths of this intervention were the increased participation of the staff and providers by embedding the PHQ-9 in the EHR. Similarly, the intervention also increased participation by patients. Lastly, the increased screening participation by the patients increased the referral of patients for treatment which is in line with the literature.

DISCUSSION

Increases in the number of mental health treatment referrals, the incidence of moderate to severe depression symptoms identified, and mental health disorders identified were seen when a depression screening program was implemented. (Miller et al., 2020). A 41% increase in diagnoses of depression was seen after a depression screening program was implemented (Randle et al., 2019). In DNP project, the pre-intervention screening rate was 29.8% versus the post-intervention screening rate of 75.28%. This is a 40% increase, which is similar to what has been reported in the literature (Randle et al., 2019). Moreover, of the participants who completed the screening, 1.75% in the pre-intervention group were referred to treatment versus 8.71% in the post-intervention group. This is a four-fold increase when comparing the pre-intervention to the post-intervention group. The increases in both groups could be due to the larger number of participants in the post-intervention group. Despite the larger numbers in the post-intervention group, the depression screening rate and referral for treatment increased, which is keeping in line with the research literature. Lastly, data from this project demonstrated that computer-based PHQ-9 administration is more effective than traditional methods, such as paper administration (Aalsma et al., 2018).

Limitations

This DNP project had several limitations. The project was implemented in one family practice, which limited the size and scope of the data collected. Similarly, the project was implemented over a six-week period which makes the implementation and assessment of the project reduced. Also, the comparison groups differed in size, which impacted the results of the study.

Implications

This DNP project demonstrated that the DNP prepared nurse can lead, prepare, and implement an evidence-based practice change. This DNP project exhibited how the DNP-prepared nurses can lead a screening program that will have an impact on other comorbidities and diseases associated with depression. Also, DNP-prepared nurses through this project proved they can lead a program that can reduce gaps in clinical care and improve mental health outcomes. Similarly, the DNP-prepared nurses can lead a program that will employ health promotion activities that focus on the prevention of depression. Lastly, DNP-prepared nurses can impact existing health inequities by reducing the gaps that exist in the early diagnosis and treatment of depression through a depression screening program.

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