Identifying Effective PHQ-9 Cut-off Points for Depression in Adolescents

Janet Wheat

Texas Woman's University

Author Note

Janet Wheat, Texas Woman's University, T. Boone Pickens Institute of Health Sciences, Dallas; Laura Kubin, Ph.D., R.N., C.P.N., C.H.E.S. and Barbara Gray, Ph.D., R.N., P.N.P. College of Nursing, Texas Woman's University.

Correspondence concerning this project should be addressed to Janet Wheat, College of Nursing, Texas Woman's University, 5500 Southwestern Medical Avenue, Dallas, Texas 75235. Jwheat1@twu.edu

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Executive Summary

Background

The United States Prevention Special Task Force (UTPSTF) recommends screening for major depressive disorder (MDD) in adolescents aged 12 to 18 years. Screening should be implemented with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up (USPSTF, 2016). The USPSTF found adequate evidence that screening instruments for depression can accurately identify MDD in adolescents aged 12-18 years in a primary care setting (USPSTF, 2016).

According to the American Psychiatric Association, (APA, 2011), the nine question Personal Health Questionnaire (PHQ-9), is the most efficacious depression-screening tool for primary care. The PHQ-9 screens for mood, energy, sleep, pleasure, and suicidal ideation during the two weeks prior to screening.

Purpose and Objectives

The purpose of this project was to identify the difference among the adolescent population diagnosed with depression using the PHQ-9 screening tool versus those not diagnosed with depression. The expected outcome was to identify an effective cut-off point on the PHQ-9 screening tool used to diagnose depression in the adolescent population. The project provided data that could result in improved depression screening in adolescents and overall implementation of best practices in the primary care setting.

Methodology

The project took place in a private practice clinic in a growing rural area in North Texas. The clinic provides primary care to more than 800 adolescent patients annually. The clinic

utilizes the PHQ-9 Depression Screening tool to diagnose patients seen in the primary care setting with complaints of depression and/or anxiety. The project identified optimal PHQ-9 cut-off points for detecting depression in the adolescent population. A retrospective chart review was used to gather the data.

Anticipated Findings and Conclusions

One anticipated finding was to identify the difference among the adolescent population diagnosed with depression using the PHQ-9 screening tool versus those not diagnosed with depression. Another expected finding was to identify an effective cut-off point on the PHQ-9 screening tool used to diagnose depression in the adolescent population. A retrospective chart review was conducted on 90 adolescent charts. An a priori power analysis was conducted using G*Power 3.1.9 to determine the minimum sample size required to find statistical significance independent samples *t*-test. With a desired level of power set at .80, an alpha (α) level at .05, and a moderate effect size of .6 (*d*), it was determined that a minimum of 90 participants were required to ensure adequate power (Cohen, 1988). The basis for this project was to identify PHQ-9 cut-off point in depression of adolescents and implementing PHQ-9 cut-off points for this improvement project.

Abstract

Purpose: The purpose of this evidence-based practice project was to identify an optimal PHQ-9 Depression screening tool cut-off point in identifying depression in the adolescent population in a primary care setting.

Methods: A plan-do-study-act model was utilized for the implementation of this project. A retrospective chart review was conducted including statistical analysis and interpretation of the PHQ-9 cut-off points in a primary care practice. A matched pairs *t*-test was used to analyze the practice-wide use of the PHQ-9 Depression Screening tool in the adolescent population.

Results: Archival data for 90 adolescents was collected. The mean age of participants was 14.97 years. Participants were predominantly Caucasian and female. Thirty-seven (41.1%) of the adolescents were diagnosed with depression based on a mean score of 12.57 on the PHQ-9. Adolescents meeting the criteria for depression had statistically significant higher PHQ-9 scores than those having no diagnosis of depression. The average or mean score for adolescents diagnosed with depression using the PHQ-9 screening tool was 12.57, however, the analysis demonstrated that a score as low as 7.5 could indicate depression. Therefore, a score of $\geq$ 7.5 was determined to be the optimal cutoff point for maximizing sensitivity of the PHQ-9 without loss of specificity.

Conclusions: The volume of adolescents seen in the primary care setting affords a rich opportunity in identifying depression in the adolescent population. Current evaluation suggests that using the validated PHQ-9 depression-screening tool with cut-off points of 7.50 or greater would be more effective in the current primary care setting, allowing for purposeful interventions to improve screening for depression in the adolescent population and their outcomes.

Keywords: Depression, primary care, PHQ-9, PHQ-9 cut-off points, screening, adolescents

Chapter 1. Problem

Depression is one of the most common mental health disorders in the United States, according to the National Institute for Mental Health (NIMH) (2018). Patients frequent clinics and hospitals with an array of complaints that stem from underlying depression. Primary care providers are often the first to identify, diagnose, and initiate treatment for mental health conditions (Colorafi, Vanselow & Nelson, 2017). Treating depression in the U.S. is a huge economic burden and has recently been addressed by the Centers for Disease Control and Prevention (CDC), Healthy People 2020 (HP2020) and The National Institute for Mental Health (NIMH), (CDC, 2012; HP2020, 2018b; NIMH, 2011).

According to the World Health Organization (WHO), depression is the leading cause of ill health and disability worldwide (WHO, 2017) and is one of the primary catalysts for patients to seek care. An estimated 300 million people globally are now living with depression, an increase of more than 18% between 2005 and 2015 (WHO, 2017) at a cost of $210.5 billion (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015). Nearly eight percent of Americans ages 12 years and older have depression, but only one third of them have been treated, according to a new report from the CDC (New York Daily Times, 2014). One in five children, either currently or at some point during their life, have had a seriously debilitating mental illness (CDC, 2018). Depression symptoms can affect a person's quality of life by interfering with their overall physical health, intrapersonal relationships and overall ability to function in society. The U.S. Preventive Services Task Force (USPSTF) recommends screening for major depressive disorder (MDD) in adolescents age 12 to 18 years. Screening should be implemented with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up (USPSTF, 2016).

In the primary care setting, there is a high probability that healthcare providers will come across someone every day with undiagnosed depression (Hardy, 2013). It is common for depressed adolescents to experience unexplained physical symptoms, such as headaches, stomachaches, and fatigue, and present to their primary care provider with recurrent somatic complaints that cannot be medically explained (Hamrin & Magorno, 2010). Due to the nature of these symptoms, patients often do not realize they are depressed; therefore, the primary care setting is the ideal place to implement routine screening for depression.

The risk factors that can help identify patients likely involve a combination of genetic, biological and environmental factors (USPSTF, 2016). Risk factors include female gender, older age, family (especially maternal) history of depression, other mental health or behavioral problems, chronic medical illness, overweight and obesity, and, in some studies, Hispanic race/ethnicity (USPSTF, 2016). Other psychosocial risk factors include childhood abuse or neglect, exposure to traumatic events (including natural disasters), loss of a loved one or romantic relationship; family conflict, uncertainty about sexual orientation, low socioeconomic status, and poor academic performance (USPSTF, 2016).

Depression is prevalent in today's population and has a significant impact on one's development and well-being (American Academy of Pediatrics, [AAP] 2018). An estimated 3.1 million adolescents aged 12 to 17 years in the U. S. had at least one major depressive episode (AAP, 2018). This number represented 12.8% of the U.S. population aged 12 to 17 (AAP, 2018). Adolescent depression (i.e. symptoms) affects nearly 10% of teenagers, and is misdiagnosed in almost 75% of adolescents, causing significant morbidity (AAP, 2018). Associations with adolescent depression demonstrate risks of educational underachievement, impaired peer and family relationships, and an exacerbation of the severity of health conditions

such as anxiety and depression as well as illicit drug dependence (AAP, 2018). For this reason, it is critical that providers screen and diagnosis adolescent depression in their practices (AAP, 2018).

The USPSTF found adequate evidence that screening instruments for depression can accurately identify MDD in adolescents aged 12-18 years in a primary care setting (USPSTF, 2016). No direct evidence on the harms of screening for MDD in adolescents was found (USPSTF, 2016). The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for MDD in children aged 11 years or younger (USPSTF, 2016).

The Personal Health Questionnaire (PHQ) was developed in the mid-1990s and the nine question Personal Health Questionnaire (PHQ-9) in 1999 by Dr. Robert J. Spitzer, Dr. Janet B.W. Williams, Dr. Kurt Kroenke, and their colleagues from Columbia University (Kroenke, Spitzer, & Williams, 2001). According to the American Psychiatric Association (APA, 2011), the PHQ-9 (Appendix A & B) is the most efficacious depression-screening tool for primary care. The PHQ-9 screens for mood, energy, sleep, pleasure, and suicidal ideation during the two weeks prior to screening. The PHQ-9 questions are based on diagnostic criteria of depression from DSM-IV and ask about the patient's experience in the last 2 weeks (Kroenke et al., 2001). The results of the PHQ-9 may be used to make a depression diagnosis according to DSM-IV criteria and the questionnaire takes less than 3 minutes to complete. DSM-IV codes are the classification found in the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision, also known as DSM-IV-TR, a manual published by the APA that includes all currently recognized mental health disorders (Appendix C). The DSM-IV codes are utilized by mental health professionals to describe the features of a given mental disorder and indicate how the

disorder can be distinguished from other similar problems (APA, 2011). PHQ-9 scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression, respectively (Kroenke et al., 2001). As a severity measure, the PHQ-9 score can range from 0 to 27, since each of the nine items can be scored from 0 (not at all) to 3 (nearly every day) (Kroenke et al., 2001).

Clinical Needs Assessment and Specific Aim

Depression is a common illness worldwide, with more than 300 million people affected. Depression is different from usual mood fluctuations and short-lived emotional responses to challenges in everyday life (WHO, n.d.). Adolescence (10-19 years) is a unique and formative time (WHO, 2018a). While most adolescents have good mental health, multiple physical, emotional and social changes, including exposure to poverty, abuse, or violence, can make adolescents vulnerable to mental health problems (WHO, 2018a). Promoting psychological well-being and protecting adolescents from adverse experiences and risk factors, which may impact their potential to thrive, are not only critical for their well-being during adolescences, but also for their physical and mental health in adulthood (WHO, 2018a). Although there are known, effective treatments for depression, fewer than half of those affected in the world receive such treatments (WHO, n.d.). At its worst, depression can lead to suicide (WHO, n.d.). Close to 800,000 people die due to suicide yearly, and suicide is the second leading cause of death in people 15-29 years old (WHO, n.d.).

The burden of depression and other mental health conditions is on the rise globally (WHO, n.d.). Barriers to effective care include a lack of resources, lack of trained health-care providers, and social stigma associated with mental disorders (WHO, n.d). A World Health Assembly resolution passed in May 2013 has called for a comprehensive, coordinated response

to mental disorders (WHO, n.d.). The theme of the World Mental Health Day 2018 was "young people and mental health in a changing world" (WHO, 2018b, subtitle). Half of all mental illness begins by the age of 14 years, but most cases go undetected and untreated. The focus was on building mental resilience among young people, to help them cope with the challenges of today's world (WHO, n.d.).

A clinical needs assessment conducted by this author identified the lack of the PHQ-9 screening tool cut-off points in identifying depression in adolescents in the primary care setting. Adolescents are under-recognized and under-treated for depression. The aim of this project was to compare the difference in PHQ-9 cut-off points between adolescents diagnosed with depression using the PHQ-9 screening tool and adolescents not diagnosed with depression at the time of screening and to identify an effective cut-off point on the PHQ-9 score to diagnose depression in the adolescent population. Identification of the PHQ-9 cut-off points in the adolescent population for clinical decision-making is important to promote improved healthcare outcomes in the primary care setting.

Problem Statement

The DSM-IV defines a major depressive episode as having had:

> at least five or more of the following nine symptoms nearly every day in the same 2-week period, where at least one of the symptoms is a depressed mood or loss of interest or pleasure in daily activities: (1) depressed mood most of the day; (2) markedly diminished interest or pleasure in all or almost all activities most of the day; (3) significant weight loss when not sick or dieting, or weight gain when not pregnant or growing, or decrease or increase in appetite; (4) insomnia or hypersomnia; (5) psychomotor agitation or retardation; (6) fatigue or loss of energy; (7) feelings of

worthlessness; (8) diminished ability to think or concentrate or indecisiveness; and (9) recurrent thoughts of death or suicidal ideation (Mental Health Today, n.d.).

At nine items, the PHQ-9 depression scale is half the length of other depression measures, has comparable sensitivity and specificity, and consists of the actual nine criteria upon which the diagnosis of DSM-IV depressive disorders is based (Kroenke et al., 2001). The absence or ineffective use of evidence-based screening tools in primary care allows for ineffective and inadequate treatment of depressive disorders (Manea, Gilbody, & McMillan, 2012).

Research Questions of Inquiry and PICOT Statement

This project addressed the diagnosis of depression in the adolescent population (12-18 years). How do adolescents diagnosed with depression differ on the PHQ-9 versus those who were not diagnosed with depression? What would be an optimal cut-off point on the PHQ-9 score to diagnose depression in the adolescent population?

The PICOT statement for the research questions is:

(P) Population – Patients age 12-18 years (male and female), in a primary practice.

(I) Intervention –To identify adolescents who were previously screened with the PHQ-9 and diagnosed with depression.

(C) Comparison – Compared to adolescents who were previously screened with the PHQ-9 and not diagnosed with depression.

(O) Outcome – To identify an optimal cut-off point of the PHQ-9 in the adolescent population.

(T) Time – Retrospective (1/2017-1/2019)

Objectives, Goals, Expected Outcomes

The objective of this project was to identify the difference in PHQ-9 cut-off points among the adolescent population diagnosed with depression using the PHQ-9 screening tool versus those not diagnosed with depression. The expected outcome was to identify an effective cut-off point on the PHQ-9 screening tool used to diagnose depression in the adolescent population. The project provided data that could result in improved depression screening in adolescents and overall implementation of best practices in the primary care setting.

Chapter 1 Summary

Depression is one of the most common mental health disorders in the United States (NIMH, 2018). Patients frequent clinics and hospitals with an array of complaints that stem from underlying depression. Primary care providers are often the first to identify, diagnose, and initiate treatment for mental health conditions (Colorafi, Vanselow, & Nelson, 2017). Nearly eight percent of Americans ages 12 years and older have depression, but only one third of them have been treated, according to a new report from the CDC (New York Daily Times, 2014). One in five children, either currently or at some point during their life, have had a seriously debilitating mental illness (CDC, 2018). The U.S. Preventive Services Task Force (USPSTF) recommends screening for major depressive disorder (MDD) in adolescents age 12 to 18 years. Screening should be implemented with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up (USPSTF, 2016). In the primary care setting, there is a high probability that healthcare providers will come across someone every day with undiagnosed depression (Hardy, 2013). The USPSTF found adequate evidence that screening instruments for depression can accurately identify MDD in adolescents aged 12-18 years in a primary care setting (USPSTF, 2016). The Personal Health Questionnaire (PHQ) was developed

in the mid-1990s and the nine question Personal Health Questionnaire (PHQ-9) in 1999 by Dr. Robert J. Spitzer, Dr. Janet B.W. Williams, Dr. Kurt Kroenke, and their colleagues from Columbia University (Kroenke et al., 2001). The absence or ineffective use of evidence-based screening tools in primary care allows for ineffective and inadequate treatment of depressive disorders (Manea et al., 2012).

Chapter 2. Review of Literature

A comprehensive search of the literature was performed to identify published studies on clinical significance, contributing factors, multidisciplinary approach and prognosis in the identification and screening for depression in adolescents (12-18 years) and addressing the use of the PHQ-9 in a primary care setting. Texas Woman's University library and Google Scholar were utilized to perform the literature review. The electronic databases utilized to perform searches included: ProQuest, PubMed, Medline, MeSH, Cochrane Library, and CINHAL plus with full text. The terms in the search strategy included Boolean connectors and the following descriptive terms: *depression, anxiety, adolescents, screening tools, PHQ-9, MDD, prevention, primary care, nurse practitioner, and risk factors.* The searches yielded over 50 results published between 2009 and 2018. Inclusion criteria were full text articles published in the English language. In all, 29 research articles relating to depression in adolescents and the use of PHQ-9 were retained for this review. The literature included peer-reviewed journal articles, retrospective and prospective cohort studies, systematic reviews, randomized control trials, cross-sectional and observational analysis, meta-analysis and opinion of experts. The articles were evaluated for strength, level of evidence, and quality based on the Stetler rating tool (Stetler et al., 1998). Selected research fell into levels I-V for their strength of evidence (Stetler et al., 1998). This literature review discusses the recommendations for depression screening in the adolescent

population and the PHQ-9 depression screening tool. The summary of all articles relevant to this evidence-based project are found in Appendix D.

Recommendations for screening

The USPSTF and the National Institute for Health and Clinical Excellence (NICE) recommend universal screening of 12 to 18-year-olds for depression in primary care (Lewandowski et al., 2013). The American Academy of Child and Adolescent Psychiatry recommends routine depression screening as part of psychiatric assessment (Lewandowski et al., 2013). In the Guidelines for Adolescent Preventive Services, the American Medical Association recommends that all children be asked annually about suicide risk and screened for signs or risk factors of depression (Lewandowski et al., 2013). NICE recommends the Mood and Feeling Questionnaire, but no other guidelines indicate a preferred tool (Lewandowski et al., 2013). The USPSTF recommends screening for depression in the adolescent population. Screening should be implemented with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up (USPSTF, 2016).

Primary care providers are well positioned to deliver important health advice to adolescents. The CDC (2017) listed the leading causes of death in adolescents as unintentional injuries (41.4 %), suicide (17.3 %), and homicide (14.9 %). Up to 20 % of the adolescents who died had a mental health condition, but less than 20 % of adolescents with a mental health condition receive treatment (Ham & Allen, 2012).

PHQ-9 screening tool for depression

A commonly used depression screening instrument is the PHQ-9 in various forms. All positive screening results should lead to additional assessment that considers severity of depression and comorbid psychological problems (e.g., anxiety, panic attacks, or substance

abuse), alternate diagnoses, and medical conditions. The optimum interval for screening for depression is unknown. The PHQ-9 was found to have acceptable diagnostic properties for detecting major depressive disorder for cut-off scores between 8 and 11 (Manea et al., 2012). More evidence is needed to identify ideal PHQ-9 cut-off points for screening depression in adolescents. A pragmatic approach in the absence of data might include screening all adolescents who have not been previously screened and using clinical judgment in consideration of risk factors, comorbid conditions, and life events to determine if additional screening of high-risk patients is warranted (USPSTF, 2016).

In a randomized clinical trial, a blinded outcome assessment was conducted between April 2010 and April 2013 to determine whether a collaborative care intervention for adolescents with depression improves depression outcomes compared with usual care (Richardson et al., 2014). The setting included nine primary care settings in the Group Health system in Washington State (Richardson et al., 2014). Adolescents (ages 13-17 years) who screened positive for depression (PHQ-9 score >10 on 2 occasions) or who screened positive and met criteria for major depression, spoke English, and had telephone access were recruited (Richardson et al., 2014). Exclusions included alcohol/drug misuse, suicidal plan or recent attempt, bipolar disorder, developmental delay, and seeing a psychiatrist (Richardson et al., 2014). Of 10,223 eligible youth who were invited to participate, screening surveys were obtained from 4010 youth (Richardson et al., 2014). Seven percent of screened youth (n=280) had a PHQ-9 score of 10 or greater and were invited to participate in a baseline interview (Richardson et al., 2014). One hundred seventy-one youth completed the baseline interview, 105 were found to be eligible for study participation, and 101 were randomized (Richardson et al., 2014). Both intervention and control youth experienced improvement with no significant differences between the groups

(Richardson et al., 2014). The conclusion of the study was that among adolescents with depression who are seen in primary care, a collaborative care intervention resulted in greater improvement in depressive symptoms at 12 months than usual care (Richardson et al., 2014). The findings suggested integration of adolescents with depression into primary care improves outcomes.

A systematic meta-analysis was conducted by Asarnow, Rozenman, Wiblin and Zeltzer (2015) to evaluate whether integrated medical-behavioral health care for children and adolescents leads to improved behavioral health outcomes compared with usual primary care. Their data sources yielded 6792 studies between January 1, 1960, through December 31, 2014. Of those 31 studies with 35 intervention-control comparisons and 13,129 participants met the study eligibility criteria (Asarnow et al., 2015). The authors included randomized clinical trials that evaluated integrated behavioral health and primary medical care in children and adolescents compared with usual care in primary care settings that met prespecified methodologic quality criteria (Asarnow et al., 2015). Of the randomly selected youth, 66% had a better outcome after receiving integrated medical-behavioral treatment than the randomly selected youth receiving usual care (Asarnow et al., 2015). Their results demonstrated increased benefits of the integrated medical-behavioral primary care for improving youth behavioral health outcomes.

In a clinical report in the American Academy of Pediatrics (AAP), Weitzman and Wegner (2015) reported 11% - 20% of children in the U. S. have a behavioral or emotional disorder, as defined in the Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition. Between 37% and 39% of children will have a behavioral or emotional disorder diagnosed by 16 years of age, regardless of geographic location in the U. S. (Weitzman & Wegner, 2015). The purpose of the report was to provide pediatricians with a rationale for and guidance to implement

screening for behavioral and emotional problems in the primary care setting (Weitzman & Wegner, 2015). The report emphasizes behavioral screening must always be one component of a comprehensive developmental and behavioral screening program that extends through childhood and adolescence (Weitzman & Wegner, 2015). Pediatricians reported numerous barriers to screening practices such as lack of time, long waits for patients to be seen by mental health providers, and the lack of mental health providers to refer those at-risk for behavioral or emotional problems (Weitzman & Wegner, 2015).

Depression in adolescents is under-recognized and undetected (Bhatta, Champion, Young & Loika, 2018). Major depressive disorder is common in children and adolescents and can be linked to functional impairment and suicide (Bhatta et al., 2018). Bhatta et al. (2018) proposed implementation of routine PHQ-9 screening among adolescents aged 12-18 years, accessing a school-based pediatric primary care clinic service for identification of adolescents at potential risk for MDD (Bhatta et al., 2018). The retrospective chart review (N-256 cases) documented PHQ-9 depression screening outcomes among adolescents accessing school-based pediatric primary care clinic services for episodic illness and wellness visits (Bhatta et al., 2018). A chart review included 53.5% females and 46.5% males. PHQ-9 depression screening was identified for 56.3% of charts with PHQ-9 scores > 10 for 12.5% among those screened (Bhatta et al., 2018). Bhatta et al. (2018) concluded that implementation of PHQ-9 depression screening protocol identified MDD among adolescents accessing the pediatric school-based primary care clinic. The PHQ-9 depression screening protocol facilitated referrals to mental health providers, potentially improved morbidity and mortality among adolescents. The authors recommended due to the high prevalence of MDD among adolescents, it is imperative to improve screening and treatment in the adolescent population via the school-based clinics.

In a randomized controlled study, Richardson et al. (2010) evaluated the PHQ-9 for detecting major depression among adolescents in a large healthcare setting in Seattle, Washington. The purpose was to examine the performance characteristics and validity of the PHQ-9 as a screening tool for depression among adolescents (Richardson et al., 2010). The PHQ-9 was completed by 442 youth (13-17 years) who were enrolled in a large healthcare delivery system and participating in a study on depression outcomes (Richardson et al., 2010). The results of their study indicated that a PHQ-9 score of > 11 had a sensitivity of 89.5% and specificity of 77.5% for detecting youth, meeting DSM-IV criteria for major depression on the DISC-IV. Analysis of the PHQ-9 had an area under the ROC curve of 0.88 (95% CI = 0.82 to 0.94) and the cut point of 11 was optimal for maximizing sensitivity without loss of specificity (Richardson et al, 2010). Increasing PHQ-9 scores were significantly correlated with increasing levels of functional impairment, as well as parental report of internalizing symptoms and psychosocial problems (Richardson et al., 2010). Even though the cut point is higher in adolescents, the PHQ-9 depression screening tool is an excellent choice for providers to utilize in their primary care settings (Richardson et al., 2010).

In a systematic review, Roseman et al. (2016) completed a systematic review to evaluate the accuracy of depression screening instruments to detect MDD in children and adolescents. This review of 17 studies and 20 depression screening tools identified inconsistent cut-off scores and insufficient evidence for depression screening instruments to accurately detect MDD in children and adolescents (Roseman et al., 2016).

The PHQ-9 depression screening tool is widely used in non-psychiatric settings (Manea et al., 2012). Manea et al., in a diagnostic meta-analysis, summarized the diagnostic test accuracy of the PHQ-9 using the algorithm scoring method across a range of validation studies and

compared the diagnostic properties of the PHQ-9 using the algorithm and summed scoring method at the proposed cut-off point of 10. The authors calculated summary sensitivity, specificity, likelihood ratios and diagnostic odds ratios for detecting MDD at different PHQ-9 cut-off points and in different settings (Manea et al., 2012). The authors found there was major variability in sensitivity for PHQ-9 cut-off points between 7 and 15 (Manea et al., 2012). The PHQ-9 was found to have acceptable diagnostic properties for detecting MDD for cut-off points between 8 and 11 (Manea et al., 2012).

In a case-controlled study, Suzuki, Kumei, Ohhira, Nozu, and Okumura (2015) examined the utility of the PHQ-9 and PHQ-2 at an outpatient clinic in a Medical University Hospital in Japan. New consecutive outpatients were included in the study. They administered the PHQ-9 to 574 patients, and acquired complete PHQ-9 and PHQ-2 data for 521 patients. Major depressive disorders were diagnosed according to the DSM-IV-TR. Forty-two patients were diagnosed with MDD. The mean PHQ-9 scores of the patients with major depressive disorders were significantly higher than the scores of the patients without depression. The best cut-off points for the PHQ-9 summary scores were ≥11 (sensitivity 0.76, specificity 0.81) and ≥3 (sensitivity 0.76, specificity 0.82), respectively. No relationship was observed between age and PHQ-9 scores. The PHQ-9 was a useful instrument for screening for MDD. The authors determined that the best cut-off point for the PHQ-9 summary score should be ≥11 to detect depression in the primary care setting (Suzuki et al., 2015).

Chapter 2 Summary

In summary, lack of screening for depression or identification of depression in the adolescent population is a major concern worldwide. Findings from the literature consistently revealed that screening adolescents for depression with the PHQ-9 depression screening tool and

utilizing optimal cut-off points enables providers to identify adolescents at-risk for or with a diagnosis of depression. Following the evidence and finding an optimal PHQ-9 cut-off point would more rapidly identify adolescents with depression. The PHQ-9 is a validated screening tool that is useful in identifying depression in the primary care setting. The PHQ-9 screening tool is brief and can be completed by the patient in minutes with rapid scoring by the provider. Providers must be aware of the recognizable signs and symptoms with which adolescents present to the clinic and be prepared to ask the appropriate questions and act promptly with screening for depression. The literature recommends screening adolescents routinely to ensure early detection and accuracy in diagnosis, treatment and follow-up in the primary care setting. However, the literature does not have a specific recommendation of a tool or an optimal PHQ-9 cut-off point for diagnosis of depression in the adolescent population. This project, therefore, would promote evidence-based best practices while providing an opportunity for improved healthcare outcomes in the adolescent population. The basis for this project was to identify a PHQ-9 cut-off point in screening for adolescent depression.

Chapter 3. Identification and Description of the Intervention

The project took place in the clinic in a growing rural area in the northern part of Texas. The clinic provides primary care to more than 800 adolescent patients annually. The clinic utilizes the PHQ-9 Depression Screening tool to identify patients seen in the primary care setting with complaints of depression. The clinic is staffed by two nurse practitioners who provide family practice care to approximately 40 patients each day. The project aimed to identify optimal PHQ-9 cut-off points for detecting depression in the adolescent population.

Sampling and Data Collection

Adolescents, both male and female, between the ages of 12 and 18 years were the targeted population for this project. Inclusion criteria were adolescents who were proficient in the English and/or Spanish languages and had completed the PHQ-9 depression screening tool previously with a complaint of depression. An a priori power analysis was conducted using G*Power 3.1.9 to determine the minimum sample size required to find statistical significance independent samples *t*-test. With a desired level of power set at .80, an alpha (α) level at .05, and a moderate effect size of .6 (*d*), it was determined that a minimum of 90 participants were required to ensure adequate power (Cohen, 1988).

Study Design, Approaches and Implementation

The project consisted of a retrospective chart review to evaluate the PHQ-9 depression screening cut-off points in the adolescent population until the minimum of 90 participants was identified. The office staff and medical assistants initiated the screening tool at the adolescent annual well visit, in addition to visits with a chief complaint of depression or anxiety. The providers scored the initial PHQ-9 screening tool and identified depression in adolescents with PHQ-9 cut-off point >10. With the increased use of the PHQ-9 as a screening tool to measure depression severity, it will be helpful to know the probability of a major or subthreshold depressive disorder at an effective PHQ-9 cut-off point for the diagnosis of depression in adolescents.

Project Objectives

The objectives of this project are:

1. To identify the difference among the adolescent population diagnosed with depression using the PHQ-9 screening tool versus those not diagnosed with depression.

2. To identify an effective cut-off point on the PHQ-9 screening tool used to diagnose depression in the adolescent population.

Timeline specifics for this project included:

November 2018 -Defended Proposal

January 2019 -Began data collection of the retrospective chart review

February 2019 -Completed data collection of the retrospective chart review

February 2019 -Analyzed and completed data results

April 2019 -Defended project results

SWOT (Strengths, Weakness, Opportunities and Threats) Analysis

A SWOT analysis (or SWOT matrix) is a strategic planning technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to business competition or project planning (Live Plan, 2018). It is intended to specify the objectives of the business venture or project and to identify the internal and external factors that are favorable and unfavorable to achieving those objectives (Live Plan, 2018). Users of a SWOT analysis often ask and answer questions to generate meaningful information for each category to make the tool useful and identify their competitive advantage (Live Plan, 2018). SWOT has been described as the tried-and-true tool of strategic analysis. It is a useful technique in that it helps to identify strengths and weaknesses and serves as a guide in identifying opportunities and possible threats of the project (Live Plan, 2018).

A strength of this project includes the current use of the PHQ-9 depression screening tool within this primary care setting. Additionally, the medical staff was already in place, and the nurse practitioners were ready for evidence-based best practice in identifying those adolescents

with depression using the PHQ-9 depression screening tool and identifying effective cut-off points for the PHQ-9.

Weaknesses of the project were: lack of PHQ-9 cut-off scores, lack of depression screening protocols, diagnosis of depression prior to establishing care with said clinic. PHQ-9 depression screening and diagnosis was not consistent within the primary care clinic and providers involved. There were also missed opportunities in screening and identification of the at-risk or depressed adolescent. Adolescents did not present to the clinic as often as they did when they were younger.

Opportunities noted include the identification of adolescents with depression with a more effective PHQ-9 cut-off point. This primary care clinic is the only healthcare facility in the rural community of approximately 15,000 individuals. The rural community is growing rapidly. The providers offer a safe environment and open communication with the adolescents and their families.

Threats include time constraints on the providers and medical staff. No cut-off points had previously been identified in the PHQ-9 depression screening tool. Adolescent confidentiality can be challenging for healthcare providers because of family, medical, ethical, legal and social concerns. Adolescents may be embarrassed to share concerns regarding chronic diseases, obesity, consequences of risky or illegal behaviors, injury, legal consequences, pregnancy, mental health, infectious diseases and addiction. Concerns about confidentiality may create barriers to open communication between patient and provider and may discourage adolescents from seeking necessary medical care and counseling (American Academy of Family Physicians, [AAFP] (2018). The AAFP believes that adolescents' access to confidential healthcare is important for their health and well-being, while also recognizing the benefit of

supportive parental involvement. Family physicians should be aware of their community's standards regarding adolescent confidentiality (AAFP, 2018). Ultimately, regarding confidentiality, the judgment by the physician regarding the best medical interest and safety of the patient should prevail (AAFP, 2018). Additionally, there are missed opportunities for screening for depression when adolescents present to the clinic for reasons other than depression

Congruence of Project to Organizations Strategic Plan

The clinic is a small family practice owned by a nurse practitioner in a fast-growing rural community. The clinic has a total of seven employees including two nurse practitioners. For the time frame being reviewed, all adolescents were not being screened for depression and a standard cut-off point on the PHQ-9 was not established. In addition to making criteria-based diagnoses of depression in the adolescent population, the PHQ-9 is a reliable and valid measure for depression severity (Manea et al., 2012). The brief PHQ-9 is commonly used to screen for depression with a score of 10 often recommended as the cut-off score (Manea et al., 2012). The nurse practitioners evaluated the PHQ-9 cut-off scores across a range of variables and identified cut-off scores to select the optimal cut-off for detecting depression in adolescents.

Depressive disorders are still under-recognized in medical settings despite major associated disability and costs (Manea et al., 2012). The PHQ-9 depression screening tool has become popular in research and practice over the past ten years. Many health care providers have argued against inflexible adherence to the PHQ-9 cut-off point of 10, which has been recommended for diagnosis of depression in the adult population (Manea et al., 2012). Other PHQ-9 recommendations are to incorporate cut-off score of 12, which could have better accuracy for diagnosing depression. Although the optimal cut-off point is higher among adolescents, the sensitivity and specificity of the PHQ-9 are similar to those of adult populations

(Richardson et al., 2010). The brief nature and ease of scoring of this instrument makes this tool an excellent choice for providers and researchers seeking to implement depression screening in primary care settings (Richardson et al., 2010).

The USPSTF recommends screening for MDD in adolescents aged 12 to 18 years. Screening should be implemented with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up (USPSTF, 2016). Given the widespread use of the PHQ-9 in screening for depression and that certain cut-off points are being recommended as part of national strategies to screen for depression, this project attempted to determine whether the cut-off of 10 is optimal for screening for depression in adolescents (Manea et al., 2012). However, the USPSTF does not have a recommendation for the PHQ-9 depression screening cut-off points in the adolescent population.

Cost-Benefit Analysis

There is no immediate or long-term financial overhead in using the PHQ-9 depression screening tool. The only expense for the clinic would be the minimal cost of paper and ink. Office staff are already paid hourly and there would be no additional staff needed.

Guiding Framework

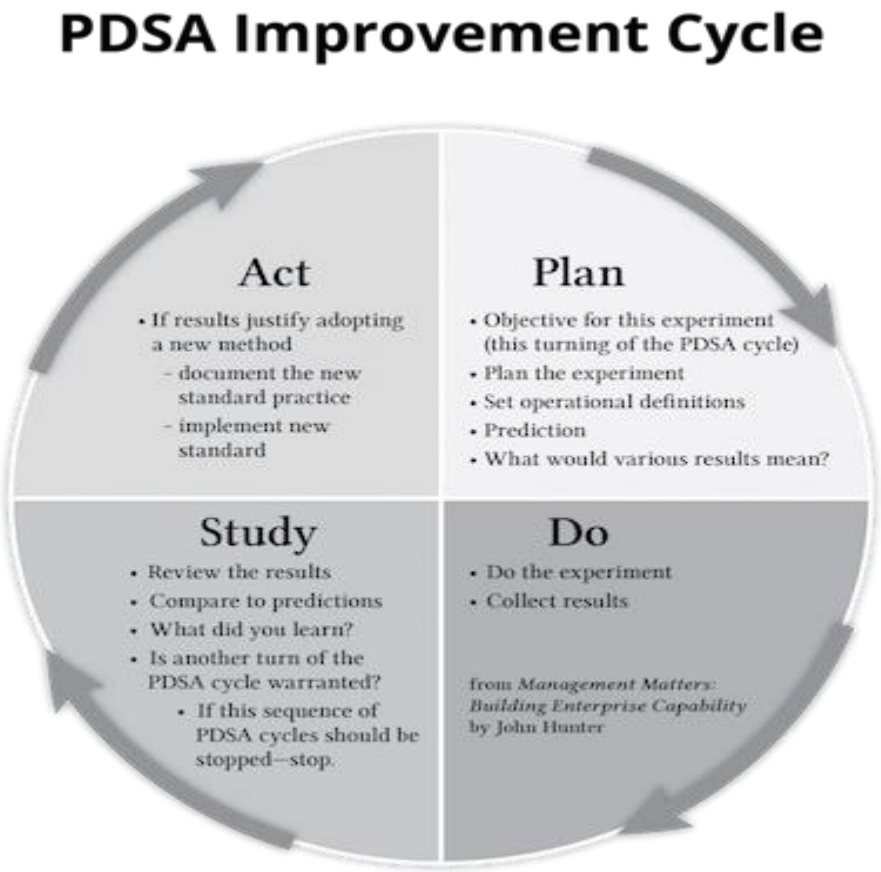
The quality improvement model that was used to guide this project was the Plan, Do, Study, Act model (PDSA) (Figure 1). The PDSA model is the common approach to clinical audit and may be explained with the help of the audit cycle. The PDSA cycle is shorthand for testing a change, by planning it, trying it, observing the results, and acting on what is learned. This is the scientific method, used for action-oriented learning. The Model for Improvement (Mind Tools, 2016) is a simple, yet powerful tool for accelerating improvement. This model was not meant to replace change models that organizations may already be using, but rather to

accelerate improvement. The Model for Improvement asks (a) What are we trying to accomplish? (b) How will we know that a change is an improvement? (c) What change can we make that will result in improvement? This project was a retrospective chart review in identifying an effective PHQ-9 cut-off point in diagnosing adolescents with depression who are current patients. With the identification of an effective PHQ-9 cut-off point, improved identification of depression among adolescents will be facilitated.

The four phases of the PDSA model includes: (1) Plan-planning the test or observation, including a plan for collecting data, state the objective of the test and make predictions about what will happen and why. "Who? What? When? Where? What data needs to be collected?", (2) Do-carry out the test with documentation of the problems and unexpected observations, developing and testing a potential solution with analysis of the data, (3) Study-set aside time to analyze the data and study the results, complete and compare, summarize and reflect on what was learned, and (4) Act-refine the changes, based on what was learned from the test, determine what modifications should be made and prepare a plan for the next test (Mind Tools, 2016). The Model for Improvement is a basic framework for the science of improvement supporting improvement efforts in small or large projects. Data was collected by a retrospective chart review of adolescents who presented to the clinic with a complaint of depression. Those adolescents were screened for depression with the PHQ-9 depression screening tool. The data was analyzed to identify a consistent PHQ-9 depression screening cut-off point for depression in adolescents. With the increased use of the PHQ-9 as a screening tool to measure depression severity, it will be helpful to know the probability of a major or subthreshold depressive disorder at an effective PHQ-9 cut-off point for depression in adolescents. Based on the results,

modifications on screening for depression in adolescents with a consistent PHQ-9 cut-off point were identified and put into place within the practice.

Figure 1. PDSA Model



Google Image

The evidence-based model used as the framework for this project is the Promoting Action on Research Implementation in Health Services (PARIHS) this framework has been changed into the integrated or i-PARIHS framework and refers to evidence-based change as practice innovation (Wyant, 2017). It contends that the core elements of successful implementation of

practice innovation are dependent on the type of evidence available, context of the care setting, and how the process is facilitated (Wyant, 2017). The framework emphasizes the importance of taking into consideration the perspectives of all recipients of the intended change (Wyant, 2017).

The Diffusion of Innovation Theory

The Diffusion of Innovation Theory is often regarded as a valuable change model for guiding technological innovation when the innovation itself is modified and presented in ways that meet the needs across all levels of adoption (Kaminski, 2011). In simple terms, the diffusion of innovation refers to the process that occurs as people adopt a new idea, product, practice, philosophy, and so on (Kaminski, 2011). As early innovators 'spread the word', more and more people become open to it, which leads to the development of a critical mass (Kaminski, 2011). Over time, the innovative idea or product becomes diffused amongst the population until a saturation point is achieved. There are five categories of adopters of an innovation: innovators, early adopters, early majority, late majority, and laggards (Kaminski, 2011). There has been a sixth group added, non-adaptors, at times if necessary. The five-stage adoption process is explained by Kaminski (2011) as: knowledge or awareness, persuasion or interest stage, decision or evaluation stage, implementation or trial stage and confirmation or adoption stage. Some of these innovations are successful, and some are not. Five distinct innovation characteristics have been identified by Kaminski (2011) to explain the mystery. These characteristics include observability, relative advantage, compatibility, trial ability, and complexity (Kaminski, 2011).

The innovator of this project was this author who was adopting a new change idea. The new idea was to identify effective PHQ-9 cut-off points for diagnosing depression in the

adolescent population. This project was the knowledge or awareness of the idea. The confirmation or adoption stage was achieved once data was collected.

In summary, effective PHQ-9 cut-off points will be valuable in identifying and diagnosing depression in adolescents. The retrospective chart review insured the PHQ-9 cut-off points to appropriately diagnosis depression in adolescents. This author projected that adolescents will be diagnosed appropriately with effective PHQ-9 cut-off points. The PHQ-9 depression screening tool is already being used in the primary care setting, but to be more effective, optimal and consistent cut-off points should be identified and utilized so that depression can be detected in the adolescent population and appropriate, timely interventions can be implemented.

Chapter 4. Results and Outcomes

The Study Question

How do adolescents diagnosed with depression differ on the PHQ-9 versus those not diagnosed with depression? What would be an optimal cut-off point on the PHQ-9 score to diagnose depression in the adolescent population?

Implementation of the Intervention

Approval of the intervention: On November 26, 2018, the author defended this DNP scholarly project to the DNP scholarly project committee at Texas Woman's University. A retrospective chart review was conducted on 90 adolescent charts. An a priori power analysis was conducted using G*Power 3.1.9 to determine the minimum sample size required to find statistical significance independent samples *t*-test. With a desired level of power set at .80, an alpha (α) level at .05, and a moderate effect size of .6 (*d*), it was determined that a minimum of 90 participants were required to ensure adequate power (Cohen, 1988). Crosstabs with Pearson Chi-Square was implemented using the three variables of determining adolescents screened by the PHQ-9 Depression Screening tool, diagnosis of MDD or no diagnosis of MDD and to identify PHQ-9 cut-off point in depression of adolescents. The instrument used was the PHQ-9 Depression Screening tool. A retrospective chart review was conducted to identify optimal PHQ-9 cut-off points in the adolescent population for this project.

Data collection

Data collection began January 2019. Participants included the author. A retrospective chart review was conducted on adolescents age 12-18 years seen in the clinic from January 1, 2017 through January 1, 2019 who were screened with the PHQ-9

Depression Screening Tool. The retrospective chart review yielded a total of 90 adolescents screened with the PHQ-9 depression screening tool during the period from January 1, 2017 thru January 1, 2019. The chart reviews identified 45 adolescents diagnosed with depression and 45 adolescents not diagnosed for depression. The data collection was completed January 2019. There were no changes to the intervention.

Analysis of Data

In January 2019, data was analyzed, and results were completed. The author was the only participant for this data collection. The author gathered the data and consulted with Texas Woman's University Center for Research Design and Analysis (CRDA), utilizing statistical methods to analyze the data.

Measurement of Project Objectives

1. To identify the difference among the adolescent population diagnosed with depression using the PHQ-9 screening tool versus those not diagnosed with depression.
2. To identify an effective cut-off point on the PHQ-9 screening tool used to diagnose depression in the adolescent population.

Descriptive Statistic for Patient Demographics and Depression Screening

The descriptive data for the project included age, gender, and ethnicity, and PHQ-9 depression screening scores. A total of 90 adolescent charts were reviewed during the retrospective chart review from January 1, 2017 thru January 1, 2019. Within the 90 adolescent charts, 45 adolescents were diagnosed with not having depression and 45 adolescents were diagnosed with depression. The study codebook for the variables is included in Appendix E.

Analyses

Descriptive statistics were calculated for the sample and disaggregated by depression status. Two categories of depression were used based on the MDD criteria: diagnosed with depressive disorder or not diagnosed with depressive disorder. For initial depression diagnosis, adolescents must have completed the PHQ-9 depression screening tool. If there were at least four check marks in the shaded section (including Questions #1 or Question #2), a depressive disorder diagnosis was considered. The scores were added to determine severity. To consider a diagnosis of MDD, there were to be at least five checks in the shaded section (one of which corresponds to Question #1 or Question #2). Since the questionnaire relies on patient self-report, all responses should be verified by the clinician, and a definitive diagnosis is made on clinical grounds considering how well the patient understood the questions, as well as other relevant information from the adolescent.

A *t*-test analysis was used to compare continuous variables or PHQ-9 scores across depressed and non-depressed adolescents. The area under the ROC curve was calculated as a quantification of the sensitivity and specificity of the ability of the self-report PHQ-9 instrument to classify adolescents as depressed or not depressed. Results were interpreted based on standards that have been set for interpreting the area under the curve (Hosmer, Lemeshow, & Sturdivant, 2013).

Results

Demographic data for 90 adolescents was collected (See Table 1). The mean age of participants was 14.97 years (*SD* = 1.96) and 76.7% (*n* = 69) of the participants were female. The sample was predominantly Caucasian (77.8%, *n* = 70) with some participants identifying as Hispanic (17.8%, *n* = 16) and Black (4.4%, *n* = 4). Forty-two (46.7%) were covered by

commercial insurance, while forty-six (51.1%) were covered by Medicaid. There was no insurance information for one participant, and one (1.1%) participant had no insurance.

Table 1

Demographics

	Frequency	Percent
Age 12-18	90	100
Sex		
Male	21	23.3
Female	66	76.7
Race		
Afr. American	4	4.4
White	70	77.8
Hispanic	16	17.8

Thirty-seven (41.1%) of the adolescents were diagnosed with depression based on the MDD classifications, and these 37 individuals had a mean score of 12.57 (SD = 3.67) on the PHQ-9. Table 2 demonstrates the descriptive statistics of the PHQ-9 scores calculated for the sample and disaggregated by depression status. Adolescents meeting the criteria for depression had statistically significant higher PHQ-9 scores than those having no diagnosis of depression, $t(88) = 8.92$, $p < .001$.

Table 2

Descriptive Statistics for PHQ-9 scores (*N* = 90)

	M	*SD*
Diagnosed with depression (*n* = 37)	12.57	3.67
Not diagnosed with depression (*n* = 53)	5.19	3.98
Total sample	8.22	5.29

Determining PHQ-9 Cut-off points with the ROC Curve

The sensitivity and specificity of a diagnostic test depends not only on the "quality" of the test, but also on the ability to distinguish a normal from abnormal test. The position of the cut-off point will determine the numbers of true positives, true negatives, false positives and false negatives. A ROC curve is useful in demonstrating the ability of a test to discriminate between normal and abnormal (i.e., depressed and not depressed). It demonstrates several things: (Hosmer et al., 2013),

1. It shows the tradeoff between sensitivity and specificity (any increase in sensitivity will be accompanied by a decrease in specificity).
2. The closer the curve follows the left-hand border and then the top border of the ROC space, the more accurate the test.
3. The closer the curve comes to the 45-degree diagonal of the ROC space, the less accurate the test.

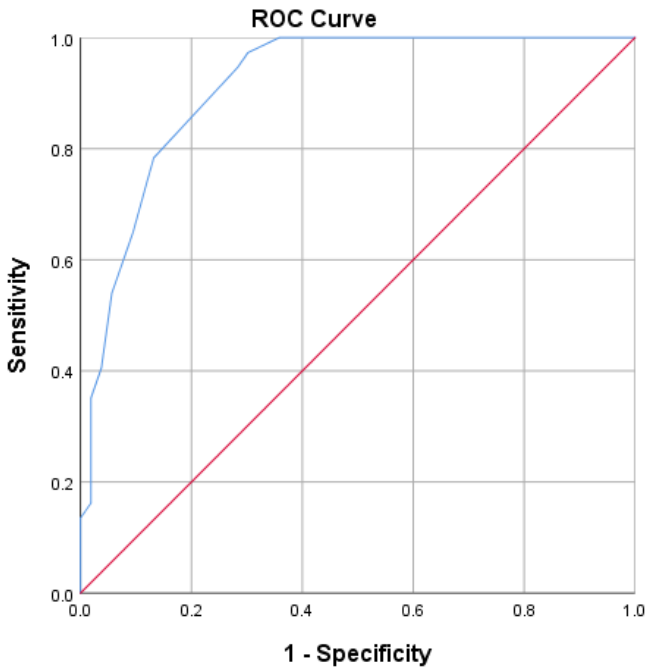
As noted, the accuracy of the test depends on how well the test separates the

group being tested into those with and without depression. Accuracy is measured by the area under the ROC curve (Figure 2). An area of 1 represents a perfect test; an area of .5 represents a worthless test. A rough guide for classifying the accuracy of a diagnostic test is the traditional academic point system:

- .90-1 = excellent (A)
- .80-.90 = good (B)
- .70-.80 = fair (C)
- .60-.70 = poor (D)
- .50-.60 = fail (F)

Figure 2

ROC Curve



On the ROC analysis (Table 3), the area under the curve for detecting depression was .914 (95%CI=85.8%-97.1%), indicating **excellent discrimination of the PHQ-9** (Hosmer et al., 2003).

Table 3
Area Under the Curve

Test Result Variable(s): PHQ9_total

Area	Std. Error[a]	Asymp Sig.[b]	Asymptotic 95% Confidence Interval Lower Bound	Upper Bound
.914	.029	.000	.858	.971

In Table 3, the area under the ROC curve is **.914**. The area can range from **0.5** to **1.0** with higher values representing better discrimination, or, simply stated, the PHQ-9 score is good at discriminating between those adolescents depressed and not depressed**.** According to Hosmer et al. (2013), a value of .914 puts the discrimination of this score as having **excellent or outstanding discrimination with the ability to distinguish between those depressed and those not depressed**. The researcher can be 95% confident that the population value of the area under the ROC curve is between .858 and .971.

The next step is to examine the coordinates of the curve to determine a cut-off score. The idea is to use the PHQ-9 diagnostic test to calculate the probability that the adolescent has depression, given a certain test result. **Sensitivity** is the proportion of patients/ adolescents *with* depression who test positive and **specificity** is the proportion of patients/adolescence *without* depression who test negative, 1-Specificity is a false positive (Hosmer et al., 2013).

Table 4 is utilized to decide the optimal cut-off point for maximizing sensitivity of the PHQ-9 without loss of specificity. There is no correct answer here; however, a score of 7.50 or greater was chosen because, at this cut-off point, the PHQ-9 had a sensitivity of 97.3% for detecting the presence of depression in adolescents. In other words, 97.3% of the time (i.e., true positive rate), using this cutoff score, adolescents would be correctly classified or diagnosed as having depression. With 1-specificity of 30.2% (i.e., false positive rate), adolescents without depression may be incorrectly classified as having depression.

Table 4

Coordinates of the Curve

Test Result Variable(s): PHQ9_total

Positive if Greater Than or Equal To[a]	Sensitivity	1 - Specificity
-1.00	1.0	1.000
.50	1.0	.887
1.50	1.0	.811
2.50	1.0	.698
3.50	1.0	.604
4.50	1.0	.453
5.50	1.0	.396
6.50	1.0	.358
7.50	.973	.302
8.50	.946	.283
9.50	.784	.132
10.50	.649	.094
11.50	.541	.057
12.50	.405	.038
13.50	.351	.019
14.50	.216	.019
15.50	.189	.019
16.50	.162	.019
17.50	.135	.000
18.50	.081	.000
19.50	.054	.000
21.50	.027	.000
24.00	.000	.000

The test result variable(s): PHQ9_total has at least one tie between the positive actual state group and the negative actual state group.

a. The smallest cutoff value is the minimum observed test value minus 1, and the largest cutoff value is the maximum observed test value plus 1. All the other cutoff values are the averages of two consecutive ordered observed test values.

Table 5 shows the test characteristics of the PHQ-9 using the MDD classifications as the standard. The average or mean score for adolescents diagnosed with depression using the PHQ-9 screening tool was 12.57; however, the analysis demonstrated that a score as low as 7.5 could indicate depression. The use of scores 8, 9, 10, 11, and 12 were also considered. When comparing scores of ≥8.50, the PHQ-9 had a sensitivity of 94.6% and a specificity of 28.3%. Among adolescents with PHQ-9 scores ≥9.50 had a sensitivity of 78.5% and specificity of 13.2%. At a PHQ-9 score of >10.5 the sensitivity was 64.9% and specificity of 9.4%. Considering scores of 11.50 and above, the PHQ-9 had a sensitivity of 54.1% and specificity of 5.7%. Finally, with a PHQ-9 cut-off score of 12.5, the sensitivity was 40.5% and specificity of 3.8% for detecting the presence of depression in adolescents. While using the higher cutoff scores decreases the likelihood that adolescence would be incorrectly diagnosed as having depression when they do not, the likelihood of not diagnosing adolescents who have depression increases.

At ≥8.5 - ≥12.5 PHQ-9 cut-off points, the sensitivity declined, thus the possibility of early detection among adolescents with depression decreased. At the cut-off point of ≥7.50, the PHQ-9 had a sensitivity of 97.3% for detecting the presence of depression in adolescents. In other words, 97.3% of the time early detection of depression would be correctly classified or diagnosed. Therefore, the optimal cut-off point was determined to be ≥ 7.5.

Table 5

Sensitivity and Specificity of the PHQ-9 Optimal Cut-off Points

PHQ-9 Score	Sensitivity	1-Specificity
>7.50	97.3	30.2
>8.50	94.6	28.3
>9.5	78.4	13.2
>10.5	64.9	9.4
>11.5	54.1	5.7
>12.5	40.5	3.8

T test

An independent *t*-test was conducted to evaluate whether adolescents significantly differed in their PHQ-9 scores based on their diagnosis. The dependent variable was the PHQ-9 scores, and the independent variable was diagnosis, with two groups (Table 6). This analysis is often included in studies that examine cut-off scores. An independent *t*-test (also known as independent sample *t*-tests or Levene's test for Equality of Variances) was the most appropriate analysis procedure here, as it is used when a researcher wants to compare the mean scores of two different groups (Warner, 2013). This analysis was used because it "involves comparison of mean scores on a quantitative Y outcome between two groups" (Warner, 2013, p. 185). The results of the independent *t* test that does assume equal variance were **significant**, $t\ (88) = 8.92$, $p < .001$. It is important to always examine the means and interpret results when significant.

Adolescents meeting the criteria for depression had statistically significant higher PHQ-9 scores (*M* = 12.57, *SD* = 3.67, *n* = 37) than those having no diagnosis of depression (*M* = 5.19, *SD* = 3.68, *n* = 53).

Table 6

Independent Sample Tests

	Levene's Test for Equality of Variance		t-test for Equality of mean					
PHQ-9 Total Equal Variances Assumed								
F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Standard Error Dif.	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
.858	.357-above a .05 so equal variance is assumed	8.930	88	.000	.379	826	5.737	9.021
PHQ-9 Equal Variances not Assumed								
F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Standard Error Dif.	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
		9.061	81.398	.000	.379	814	5.759	8.999

The USPSTF and NICE recommend universal screening of 12-18-year-olds for depression in primary care (Lewandowski et al., 2013). The American Academy of Child and Adolescent Psychiatry recommends routine depression screening as part of psychiatric assessment (Lewandowski et al., 2013). The USPSTF also recommends that screening for depression in the adolescent population be implemented with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up (USPSTF, 2016). Primary care providers are positioned well to deliver important health advice to adolescents seen in the primary care setting.

The PHQ-9 is a commonly used depression-screening instrument in various forms. Manea et al. (2012), in a diagnostic meta-analysis, summarized the diagnostic test accuracy of the PHQ-9 using the algorithm scoring method across a range of validation studies and compared the diagnostic properties of the PHQ-9 using the algorithm and summed scoring method at the proposed cut-off point of 10. The authors calculated summary sensitivity, specificity, likelihood ratios and diagnostic odds ratios for detecting MDD at different PHQ-9 cut-off points and in different settings. The authors found variability in sensitivity for PHQ-9 cut-off points between 7 and 15 (Manea et al., 2012). The PHQ-9 was found to have acceptable diagnostic properties for detecting MDD in cut-off points between 8 and 11 (Manea et al., 2012). However, Manea, et al. (2012) suggested more evidence is needed to identify ideal PHQ-9 cut-off points >10 for depression in adolescents.

In a randomized clinical trial, Richardson et al., 2014 found adolescents (aged 13–17 years) who screened positive for depression (Patient Health Questionnaire 9-item [PHQ-9] score ≥10) on 2 occasions or who screened positive and met criteria for major depression, spoke English, and had telephone access were recruited. Exclusions included alcohol/drug misuse,

suicidal plan or recent attempt, bipolar disorder, developmental delay, and seeing a psychiatrist. The conclusion was that among adolescents with depression seen in primary care, a collaborative care intervention resulted in greater improvement in depressive symptoms at 12 months than usual care (Richardson et al., 2014). Their findings suggested integration of adolescents with depression into primary care improves outcomes.

Bhatta et al. (2018) proposed implementation of routine PHQ-9 screening among adolescents aged 12-18 years. The PHQ-9 depression screening identified adolescents with PHQ-9 scores >10 for those screened. Bhatta et al. (2018) concluded that implementation of PHQ-9 depression screening protocol identified MDD among adolescents accessing a pediatric school-based primary care clinic. The PHQ-9 depression screening protocol facilitated referrals to mental health providers and potentially improved morbidity and mortality among adolescents.

Costa et al. (2016) set out to determine the sensitivity and specificity of three depression screening scales to diagnose major depressive episodes in the elderly. Depressive symptoms in depressed and non-depressed subjects were assessed by independent administration of the 15-item Geriatric Depression Scale (GDS-15), Patient Health Questionnaire-9 (PHQ-9), and 17-item Hamilton Rating Scale for Depression (HDRS-17). Patients with major depression and controls did not differ in age or gender distribution (Costa, et al., 2016). The sensitivity and specificity of all scales to identify a major depressive episode in older adults were ≥ 90% (Costa et al., 2016). There were no significant differences between the areas under the ROC curve for PHQ-9 vs. HDRS-17 ($z = 1.2$, $p = 0.2$), PHQ-9 vs. GDS-15 ($z = 0.26$, $p = 0.8$), or HDRS-17 vs. GDS-15 ($z = 1.2$, $p = 0.2$) (Costa et al., 2016). The researchers suggested that the study provides evidence supporting the use of PHQ-9 and GDS-15, both of which are simple to administer and easy to interpret, to diagnose major depressive episodes in older adults without neurocognitive disorders.

In the study with older adults, the PHQ-9 (cutoff ≥ 10) had sensitivity of 63% and specificity of 82% (Costa et al., 2016). In contrast, their study showed a much better diagnostic profile for the PHQ-9, since the same cutoff value had sensitivity and specificity of 94% for the identification of a major depressive episode (Costa et al., 2016). Thus, the PHQ-9 (cut-off ≥10) scale is suitable for screening and identification of major depressive episode in older adults without neurocognitive disorders.

Manea, Gilbody, and McMillan (2014) noted the depression module of the Patient Health Questionnaire-9 (PHQ-9) is a widely used depression screening instrument in non-psychiatric settings. The PHQ-9 can be scored using different methods, including an algorithm based on *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria and a cut-off based on summed-item scores. The algorithm was the originally proposed scoring method to screen for depression. Manea et al. (2014) summarized the diagnostic test accuracy of the PHQ-9 using the algorithm scoring method across a range of validation studies, comparing the diagnostic properties of the PHQ-9 using the algorithm and summed scoring method at the proposed cut-off point of 10. Manea et al., (2014) performed a systematic review of diagnostic accuracy studies of the PHQ-9 using the algorithm scoring method to detect major depressive disorder (MDD). Meta-analytic methods were used to calculate summary sensitivity, specificity, likelihood ratios and diagnostic odds ratios for diagnosing MDD (Manea et al., 2014). In studies that reported both scoring methods (algorithm and summed-item scoring at proposed cut-off point of ≥ 10), comparing the diagnostic properties of the PHQ-9 using these methods (Manea et al., 2014). Pooled sensitivity for algorithm scoring method was lower while specificities were good for both scoring methods (Manea et al., 2014). The Manea et al. (2014) review showed that if the algorithm scoring method is used, the PHQ-9 has a low sensitivity for detecting MDD.

The summed-item score method at proposed cut-off point of ≥ 10 has better diagnostic performance for screening purposes or where a high sensitivity is needed (Manea et al., 2014).

In summary, this study examined the test characteristics of the PHQ-9 in an adolescent population. The PHQ-9 is a validated screening tool that is useful in identifying depression in adolescents in the primary care setting. The average or mean score for adolescents diagnosed with depression using the PHQ-9 screening tool was 12.57, however, the analysis demonstrated that a score as low as 7.5 could more accurately detect depression earlier. With a PHQ-9 score of ≥ 7.5, (97.3% of the time), adolescents would be correctly classified or diagnosed as having depression; therefore, a cut-off point of 7.5 or greater is optimal for early detection of the presence of depression in adolescents.

Chapter 5

Ethical implications

This project was presented to the TWU Committee Chair and Co-Chair and was identified as exempt from IRB review. There was no risk to the retrospective chart review of adolescents who completed the PHQ-9 Depression Screening tool.

Limitations of the Study

The most significant limitation is the small sample size. Limitations also include the small number of healthcare providers involved in the process that may not represent the views of a larger group of providers. Other limitations may include the adolescents' fear of lack of confidentiality, socioeconomic status, peer acceptance and parental support. In this retrospective chart review, adolescents were screened by this author, who is a NP and one other NP within the clinical setting. There were no significant limitations of this retrospective chart review. The setting had no influence or limitations in the findings.

Plan for Maintaining the Improvement

With the finding of an optimal PHQ-9 cut-off point of ≥7.50, this author may improve the diagnosis of adolescents with MDD more appropriately and effectively in the family healthcare setting. All adolescents age 12 – 18 years in this setting should be screened for depression using the PHQ-9 Depression Screening tool. This DNP project will promote improved protocol, education and updated documentation in order to improve patient outcomes by utilizing an evidence-based, standardized PHQ-9 Depression Screening tool with consistent cut-off points ≥7.50 in the adolescent population.

Recommendations

Recommendations for future screenings with the PHQ-9 cut-off scores of ≥7.50 include improvement in making diagnoses,

, improvement in provider and staff knowledge regarding the

importance of the screening, and having a consistent PHQ-9 cut-off point when screening adolescents for depression.

DNP Role Considerations and Implications

The DNP Essentials represent the educational expectations for the DNP program (American Association of Colleges of Nursing, 2006). Selected Essentials I, II,

III, VI, VII and VIII will be discussed as they apply to this project.

Essential I: Scientific Underpinnings for Practice

Essential I prepares the DNP graduate to integrate nursing science with knowledge from ethics, the biophysical, psychosocial, analytical, and organizational sciences as the basis for the highest level of nursing practice. Additionally, the DNP graduate develops and evaluates new practice approaches based on nursing theories and theories from other disciplines. The quality

improvement model that was used to guide this project was the Plan, Do, Study, Act model (PDSA) (Figure 1). The PDSA model is the common approach to clinical audit and may be explained with the help of the audit cycles. The PDSA cycle is shorthand for testing a change, by planning it, trying it, observing the results and acting on what is learned.

Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking

Essential II promotes quality improvement in development and evaluating the care delivery approaches that meet current and future needs of patient populations based on scientific findings in nursing and other clinical sciences, as well as organizational, political, and economic sciences. The DNP student ensured accountability for quality of health care and patient safety for populations with whom they work.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

The literature was critically appraised to determine the need for an optimal PHQ-9 Depression Screening cut-off score in the adolescent population. The evidence-based model used as the framework for this project is the Promoting Action on Research Implementation in Health Services (PARIHS) this framework has been changed into the integrated or i-PARIHS framework and refers to evidence-based change as practice innovation (Wyant, 2017). The model contends that the core elements of successful implementation of practice innovation are dependent on the type of evidence available, context of the care setting, and how the process is facilitated (Wyant, 2017). The framework emphasizes the importance of taking into consideration the perspectives of all recipients of the intended change (Wyant, 2017). Using this framework contributes to safe, effective, patient-centered care and consistent PHQ-9 cut-off scores in screening for depression in adolescents, generating to evidence for nursing practice.

Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes

Essential VI facilitates the DNP graduate with effective communication and collaborative skills in the development and implementation of practice models, peer review, practice guidelines, health policy, standards of care, and/or other scholarly products. Consultative and leadership skills with intraprofessional and interprofessional teams promotes change in health care and complex healthcare delivery systems.

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health

Essential VII synthesizes concepts, including psychosocial dimensions and cultural diversity, related to clinical prevention and population health in developing, implementing, and evaluating interventions to address health promotion/disease prevention efforts, improve health status/access patterns, and/or address gaps in care of individuals, aggregates, or populations.

Essential VIII: Advanced Nursing Practice

The DNP student demonstrated advanced levels of clinical judgment, systems thinking, and accountability in designing, delivering, and evaluating evidence-based care to improve patient outcomes in identifying a PHQ-9 depression screening tool cut-off score of >7.50 when assessing and diagnosing depression in adolescents.

Plan for Dissemination

This retrospective chart review of adolescents who were screened for depression using the PHQ-9 Depression Screening tool will be presented at the Graduate Research Symposium at TWU in April 2019.

Chapter 5 Summary

In summary, the author identified the statistical methods and presented the interpretations and findings from Chapter 4, study limitations, and plans for maintaining a consistent PHQ-9 optimal cut-off point of ≥7.50 when assessing and diagnosing adolescents with depression. The author incorporated the AACN Essentials for Doctorate Education for Advanced Practice Nurses into this project. Plans for dissemination of the study were identified.

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Appendix A

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME:_____ DATE:_____

Over the last 2 *weeks*, how often have you been bothered by any of the following problems?
(use "√" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite —being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3
add columns		+	+	

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card). TOTAL:

10. 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 _____

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Appendix B

Guideline recommendations utilizing patients; PHQ-9 score to assist with potential treatment options

Depression treatment recommendation

1. Scores of 1-4 fall in the normal range-minimal depression
    a. Reassurance with supportive counseling and validation of coping skills
    b. Recommend physical activity
    c. Patient self-manages
    d. Educate to call if symptoms worsen
2. Scores of 5-9 suggest mild depression elevated level of stress and/or at-risk for depressive disorder
    a. Clarification of duration of symptoms and current stressors
    b. Brief Intervention with HEALTH and/or consultation with Behavioral Health
    c. Watchful waiting (allow time to pass to assess for improvement or decompensation before offering pharmacological or behavioral health interventions
    d. Repeat PHQ-9 at next visit
    e. Educate to call PCP if symptoms worsen
3. Scores of 10-14 suggest moderate depression, elevated level of stress and likely depressive disorder diagnosis
    a. Clarification of duration of symptoms and current stressors
    b. Brief intervention with HEALTH
    c. Review of treatment options with PCP and watchful waiting
    d. Follow up in 4 weeks with office visit or phone call
    e. Educate to call PCP if symptoms worsen
4. Scores of 15-19 suggest moderately severe depression with very elevated level of stress, depression and a risk for self-harm
    a. Clarification of duration of symptoms, current stressors and available support systems to assure safety
    b. Safety assessment with regards to Suicidal and/or Homicidal Ideations
    c. Review of treatment options with PCP including antidepressant medication and referral to behavioral health
    d. Educate to call PCP if symptoms worsen
5. Scores of 20-27 endorse severe depression
    a. Clarification of duration of symptoms, current stressors and available support systems to assure safety
    b. Safety assessment with regards to Suicidal and/or Homicidal Ideations
    c. Antidepressant medication recommended
    d. Immediate referral to behavioral health/expedites for collaborative management of depression
6. Positive Endorsement of item 10 (Suicidal Ideation)

a. Safety assessment with regards to Suicidal and/or Homicidal Ideation
b. Educate about available resources: Local Crisis Team, Emergency Room, Crisis Hotline
c. Availability of practice behavioral health provider

Appendix C

Severity	PHQ-9 Scores	Possible Diagnoses	Treatment Recommendations
Undefined	Initial Score: 5-9	Does not meet criteria for major depressive disorder Consider for persistent depressive disorder	Stay in touch: a) If no improvement after one or more months, consider treating or referral to behavioral health. b) If symptoms deteriorate, start treatment or make a referral.
	Follow-up Score: 5-9	Partial remission	Continue stepped therapies approach.
Per DSM-5: Few, if any, symptoms in excess of those required to make the diagnosis are present, the intensity of the symptoms is distressing but manageable, and the symptoms result in minor impairment in social or occupational functioning.	10-14	Mild major depression	Combined psychotherapy and pharmacotherapy treatment. When unable to do combined therapy due to patient preferences, availability and affordability of the treatments, start with psychotherapy. Initially consider weekly contacts to ensure adequate engagement, then at least monthly.
Per DSM-5: The number of symptoms, intensity of symptoms, and/or functional impairment are between those specified for "mild" and "severe."	15-19	Moderate major depression	Combined psychotherapy and pharmacotherapy treatment. When unable to do combined therapy due to patient preferences, availability and affordability of the treatments, start with psychotherapy. Initially consider weekly contacts to ensure adequate engagement, then at least every 2-4 weeks.
Per DSM-5: The number of symptoms is substantially in excess of that required to make the diagnosis, the intensity of the symptoms is seriously distressing and unmanageable, and the symptoms markedly interfere with social and occupational functioning.	≥20	Severe major depression	Combined psychotherapy and pharmacotherapy treatment. When unable to do combined therapy due to patient preferences, availability and affordability of the treatments, start with pharmacotherapy. Weekly contacts until less severe.
Meets DSM-5 criteria for persistent depressive disorder		Pure dysthymia	Consider starting with medication. Consider stepped care, which includes augmenting medications and adding psychotherapy for patients who don't improve.
Meets DSM-5 criteria for persistent depressive disorder		Chronic major depression	Combined psychotherapy and pharmacotherapy treatment.

This table was designed to translate the PHQ-9 scores into DSM-5 categories and then integrate evidence-based best practice. It does not directly correspond to the PHQ-9 Scoring Guide in Appendix A, "Patient Health Questionnaire (PHQ-9)" (Institute for Clinical Systems Improvement, 2018).

Appendix D

SYNTHESIS OF LITERATURE AND LEVELS OF EVIDENCE

Synthesis Section	Specific Themes	Variations: Concepts	Variations: Methods and Design	Citations: Author and Year	Level of Evidence
1	American Academy of Family Physicians recommendation for clinical preventive services	Adolescents/Teenagers Depression	From the opinion of authorities and/or reports of expert committees	American Academy of Family Physicians (2018)	VII
2	Adolescent Depression Screening	Primary Care-Feasible screening tests Children and Adolescents	From the opinion of authorities and/or reports of expert committees	American Academy of Pediatrics (2018)	VII
3	The Essentials of Doctoral Education for Advanced Nursing Practice.	Essentials	From the opinion of authorities and/or reports of expert committees	American Association of Colleges of Nursing (2006)	VII
4	Patient Health Questionnaire	Adolescents/Teenagers Guidelines	From the opinion of authorities and/or reports of expert committees	American Psychiatric Association (2011)	VII
5	Integrated medical-behavioral care compared with usual primary care for child and adolescent behavioral health: A meta-analysis	Adolescents/Teenagers	Meta-Analysis	Asarnow, Rozenman, Wiblin & Zeltzer (2015)	I
6	Outcomes of depression screening among adolescents accessing school-based pediatric primary care clinic services.	Adolescents/Teenagers Depression Screening	Retrospective Chart Review	Bhatta, Champion, Young & Loika (2018)	V
7	Prevalence of current depression among persons aged ≥12 years, by age group and sex — united states, national health and nutrition examination survey, 2007–2010.	Depression >12 years	From the opinion of authorities and /or reports of expert committees	Centers for Disease Control and Prevention, (2012)	VII
8	Adolescent Health	Adolescents/Teenagers	From the opinion of authorities and /or reports of expert committees	Centers for Disease Control and Prevention, (2017)	VII
9	Learn about mental illness	Children/Adolescents Teenagers	From the opinion of authorities and /or reports of expert committees	Centers for Disease Control and Prevention, (2018)	VII
10	Statistical power analysis for the behavioral sciences.	Statistics	From the opinion of authorities and /or reports of expert committees	Cohen (1998)	VII
11	Treating anxiety and depression in primary care: Reducing barriers to access.	Adolescents/Teenagers Barriers	From the opinion of authorities and /or reports of expert committees	Colorafi, Vanselow, & Nelson (2017)	VII

Synthesis Section	Specific Themes	Variations: Concepts	Variations: Methods and Design	Citations: Author and Year	Level of Evidence
12	Accuracy of three depression screening scales to diagnose major depressive episodes in older adults without neurocognitive disorders.	Adult Depression Screening	Well-designed RCT	Costa, Diniz, Nascimento, Pereira, Dias, Malloy-Diniz & Diniz (2016)	II
13	The economic burden of adults with major depressive disorder in the United States and 2010).	Adult Depression Screening Burdens	From the opinion of authorities and /or reports of expert committees	Greenberg, Fournier, Sisitsky, Pike & Kessler (2015)	VII
14	Adolescent health screening and counseling.	Adolescent Screening Depression	From the opinion of authorities and /or reports of expert committees	Hamm & Allen (2012).	V
15	Assessment of adolescents for depression in the pediatric primary care setting.	Adolescent Screening	From the opinion of authorities and /or reports of expert committees Systemic reviews	Hamrin & Magorno, (2010)	V
16	Prevention and management of depression in primary care.	Depression Prevention and Management	From the opinion of authorities and /or reports of expert committees	Hardy (2013)	VII
17	Depression in children and adolescents	Depression Screening	From the opinion of authorities and /or reports of expert committees	Healthy People 2020 (2018a)	VII
18	Mental Health	Adolescents/Teenagers	From the opinion of authorities and /or reports of expert committees	Healthy People 2020 (2018b)	VII
19	Applied logistic regression	Statistics	From the opinion of authorities and /or reports of expert committees	Hosmer, Lemeshow & Sturdivant (2013)	VII
20	PHQ-9	Screening Guidelines	From the opinion of authorities and /or reports of expert committees	Institute for Clinical Systems Improvement (2018)	VII
21	Diffusion of innovation theory: Theory in nursing informatics column	Theory	From the opinion of authorities and /or reports of expert committees	Kaminski (2011)	VII
22	The PHQ-9: Validity of a brief depression severity measure.	Children and Adolescents Screening	From the opinion of authorities and /or reports of expert committees	Kroenke, Spitzer & Williams (2001)	VII
23	Evidence for the management of adolescent depression.	Depression Management	Randomized Clinical Trials Systemic reviews Evidence-based Practices	Lewandowski, Acri, Hoagwood, Olfson, Clarke, Gardner,…Horwitz (2013)	I
24	What is a SWOT analysis, and how to do it right (with examples).	Analysis	From the opinion of authorities and /or reports of expert committees	Live Plan (2018)	VII

Synthesis Section	Specific Themes	Variations: Concepts	Variations: Methods and Design	Citations: Author and Year	Level of Evidence
25	Optimal cut-off score for diagnosing depression with the patient health questionnaire (PHQ-9): A meta-analysis.	Adolescents/Teenagers	Meta-analysis	Manea, Gilbody, & McMillan (2012)	I
26	A diagnostic meta-analysis of the patient health questionnaire-9 algorithm scoring method as a screen for depression	Scoring method	Meta-analysis	Manea, Gilbody & McMillan (2014)	I
27	Major depressive episode	Adolescents at risk for depression	Meta-analysis	Mental Health Today (n.d.)	I
28	Plan-Do-Study-Act	Theory	From the opinion of authorities and /or reports of expert committees	Mind Tools (2016)	VII
29	Mental Health Information	Cost	From the opinion of authorities and /or reports of expert committees	National institute for mental health (2011)	VII
30	8 percent of Americans are depressed, CDC study finds	Adolescents/Teenagers Primary Care	From the opinion of authorities and /or reports of expert committees	New York Daily Times (2014)	VII
31	Evaluation of the patient health questionnaire (PHQ-9) for detecting major depression among adolescents.	Children and Adolescent Screening	Randomized Clinical Trial	Richardson, McCauley, Grossman, McCarty, Richards, Russo, … Katon (2010)	II
32	Collaborative care for adolescents with depression in primary care: A randomized clinical trial.	Adolescent Health Care	Randomized Clinical Trial	Richardson, Ludman, McCauley, Lindenbaum, Larison, Zhou,…Katon (2014)	II
33	Accuracy of depression screening tools to detect major depression in children and adolescents.	Accuracy of Depression Screening	Systemic Review	Roseman, Kloda, Saadat, Riehm, Ickowicz, Baltzer,… Thombs (2016)	I
34	Utilization-focused integrative reviews in a nursing service.	Nursing Services	From the opinion of authorities and /or reports of expert committees	Stetler, Morsi, Rucki, Broughton, Corrigan, Fitzgerald,…Sheridan (1998)	VII
35	Screening for major depressive disorders with the patient health questionnaire (PHQ-9 and PHQ-2) in an outpatient clinic staffed by primary care physicians in Japan: A case control study.	PHQ-9	Case Control Study	Suzuki, Kumei, Ohhira, Mozu & Okumura (2015)	IIV
36	Final recommendation statement: Depression in children and adolescents	Adolescents/Teenagers Screening Recommendations	From the opinion of authorities and /or reports of expert committees	U.S. Preventive Services Task Force (2016)	VII

Synthesis Section	Specific Themes	Variations: Concepts	Variations: Methods and Design	Citations: Author and Year	Level of Evidence
37	Promoting optimal development: Screening for behavioral and emotional problems	Screening	Promoting optimal development: Screening for behavioral and emotional problems	Weitzman & Wegner (2015)	VII
38	World mental health day	Mental Health	From the opinion of authorities and /or reports of expert committees	World Health Organization (n.d.)	VII
39	Depression: Let's talk.	Depression	From the opinion of authorities and /or reports of expert committees	World Health Organization (2017)	VII
40	Adolescent mental health	Mental Health	From the opinion of authorities and /or reports of expert committees	World Health Organization (2018a)	VII
41	World mental health day	Mental Health	From the opinion of authorities and /or reports of expert committees	World Health Organization (2018b)	VII
42	Adopt an evidence-based practice model to facilitate practice change.	Theory	From the opinion of authorities and /or reports of expert committees	Wyant (2017)	VII

Key to Evidence Levels:

Level I Evidence — From systematic review or meta-analysis of all relevant randomized controlled trials (RCT's), or evidence-based clinical practice guidelines based on systematic reviews of RCT's

Level II Evidence — From at least one well-designed RCT

Level III Evidence — From well-designed controlled trials without randomization

Level IV Evidence — From well-designed case-control and cohort studies

Level V Evidence — From systematic reviews of descriptive and qualitative studies

Level VI Evidence — From single descriptive or qualitative study

Level VII Evidence — From the opinion of authorities and/or reports of expert committees

Adapted from Melnyk, & Fineout-Overholt (2005). Evidence-based practice in nursing and healthcare: A guide to best practice, Rating system for the Hierarchy of Evidence, page 10.

Appendix E

Study Code Book

Variable Description	SPSS Variable Name	SPSS Variable Label
Identification Number 1-90	ID	Enter as is
Age-in years (12-18)	Age	Enter as is
Sex	Sex	1=Male
		2=Female
Ethnicity	Ethnicity	1=African American
		2=Caucasian
		3=Hispanic
		4=Other
PHQ-9 total	PHQ-9 total	1 thru 27
MDD Diagnosis	MDD Diagnosis	1=Diagnosed MDD
		2=Not Diagnosed MDD
Insurance	Insurance	1=Commercial
		2=Medicaid
		3=No Insurance