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FROM: Dean, College of Graduate Studies and Research

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Date of Examination/Defense: 12/05/2024

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EXAMINATION SATISFACTORY

Milena Staykova — 12/05/2024
Committee Chairperson — Date

Committee Member — 12/05/2024
Committee Member — Date

Karen Valcheff — 12/05/2024
Committee Member — Date

EXAMINATION UNSATISFACTORY

Committee Chairperson — Date

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Abstract

Depression and obesity often coexist, and healthcare providers play a special role in their early identification and treatment. The United States Preventative Service Task Force (USPSTF) recommended screening all adults with a body mass index (BMI) of 30 or greater and assessing them for depression in primary care settings. However, healthcare providers were challenged to identify those patients with a BMI of 30 or greater who suffer from depression due to the time constraints of a clinical visit, decreased patient engagement in treatment decision-making, and lack of psychosocial resources. Patients with a BMI of 30 or greater and suffering from depression may not be identified if standards of practice for screening are not followed. Adding an electronic health record (EHR) alert may help providers increase the incidence of screening for those patients with a BMI of 30 or greater for early identification and treatment of depression. The purpose of this study was to examine if integrating an EHR alert into patient charts increased the incidence of screening patients with a BMI of 30 or greater for early identification and treatment of depression. After an Institutional Review Board approval, this quality improvement study used a retrospective-prospective design for examining the relationship between the study variables. The Patient Health Questionnaire-9 (PHQ-9) was used to identify depression. The study took place in North Virginia at an integrated primary care clinic. Retrospectively, out of 100, only 33 charts, and prospectively, out of 100, only 30 charts met the inclusion criteria. The charts were reviewed to examine if the incidents of screening for depression increased after the integration of the EHR alerts in the patient's chart. Pearson's correlations were calculated, and the results showed a moderate correlation of 0.50 and a *p*-value of 0.047, indicating a statistically significant relationship between EHR alerts to improve screening for depression in patients with a BMI of 30 or greater and the early identification and

treatment of depression. This study reinforced the standards of care for screening patients with a BMI of 30 or greater for depression, which helped reduce healthcare disparities.

Keywords: *obesity, BMI ≥ 30, depression screening, primary care, PHQ-9*

Dedications

This dissertation is dedicated to my late mother, Viola Marie James, who instilled in me the values of preservation and education. Your spirit will forever remain in all my endeavors and achievements.

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Table of Contents

Chapter 1

Depression and obesity often coexist, and healthcare providers play a special responsibility for their early identification and treatment. The United States Preventative Service Task Force (USPSTF) recommended screening all adults in primary care with a body mass index (BMI) of 30 or greater (categorized as obese) and assessing them for depression (Tronieri et al., 2019). However, healthcare providers were challenged by multiple factors to identify those patients with a BMI of 30 or greater who suffer from depression. Some of those factors included "the time constraints of clinical visits, decreased patient engagement in treatment decision-making, and lack of psychosocial resources" (Beck et al., 2022, p. 9). Patients with a BMI of 30 or greater and suffering from depression may not be identified if standards of practice for screening are not followed (Arhi et al., 2021). Many providers did not routinely screen for depression in primary care, and a significant number of patients suffering from depression were not identified or treated (Blackstone et al., 2022; Garcia et al., 2022; Pfoh et al., 2020). Research has concluded that after the implementation of screening policies, the screening for depression improved from 40.5% to 88.8%, reducing disparities in the early identification and treatment of depression (Garcia et al., 2022). Adding an electronic health record (EHR) alert in patients' charts may empower providers increase the incidence of screening those patients with a BMI of 30 or greater for early identification and treatment of depression (Pfoh et al., 2020).

Screening for depression in patients who present with a BMI of 30 or greater was crucial due to the wide range of negative effects, including chronic conditions such as metabolic changes and cardiovascular conditions, to psychological problems, including anxiety and depression (Fu et al., 2023). Research concluded that depression and obesity have a close relationship, and both must be identified as early as possible (Garg et al., 2019; Rudisill et al.,

2016). An EHR alert was used in one study to analyze the correlation between obesity, depression, and healthcare costs, and the results indicated the positive benefits of EHR alerts or other alert notifications for early identification of screening for depression in obese patients (Rudisill et al., 2016). Other studies used EHR alerts to notify providers to screen patients for depression using screening tools such as Patient Health Questionnaires (PHQs), especially the PHQ-9, and the findings were positive (Jeffery et al., 2021; Larson et al., 2022; Siniscalchi et al., 2020).

Approximately 300 million people suffered from depression, and it was estimated that 8% of the adult population 20 years and older would experience depression in their lifetime (Hudson & Collins-Anderson, 2022). In addition, about two or three individuals were undiagnosed for depression and left untreated (Williams et al., 2017). Health care for those diagnosed with depression cost approximately $210 billion annually (Cutler et al., 2022). Underdiagnosed depression led to employment challenges, insomnia, illicit drugs and alcohol use, recurrent inpatient stays, or suicide, all further increasing healthcare costs (Liu et al., 2023). Depression can be hereditary or can be attributed to childhood trauma and emotional, physical, or stressful environmental events (Shao & Zhu, 2020). If providers in primary care settings did not routinely screen patients, especially those with a BMI of 30 or greater, for depression, the disparities in care may worsen, leading to poorer patient outcomes (Samples et al., 2019).

Various treatment methods have been utilized to combat obesity, including lifestyle changes, pharmacotherapy, and weight loss procedures (Pitche’ et al., 2020). One of the most common treatment options is bariatric surgery (Chacon et al., 2022). Bariatric surgery can help with weight reduction, reverse complications and long-term chronic conditions such as diabetes and hypertension, and decrease mortality rates (Chacon et al., 2022). As a result of bariatric

surgery, patients may experience significant improvement in their mental health, including a reduction in depressive symptoms, improved self-esteem, psychosocial skills, and overall physical well-being (Pitche' et al., 2020). However, even though treatment options are available, many individuals suffering from obesity continue to struggle with depression (Pitche' et al., 2020).

Despite the best practices for diagnosing depression in outpatient settings, there is an underutilization of screening tools, such as the PHQ 2, 8, and 9 (Samples et al., 2019). The PHQ-9 is the gold standard for identifying patients with depression. If patients are identified early for depression with the utilization of screening tools, they can be treated earlier to improve their health outcomes.

Adding electronic alerts to patient charts may help improve the workflow process related to notifying providers to screen for specific conditions in outpatient settings, close the standards of care gap, and hopefully improve the health outcomes for patients with a BMI of 30 or greater who may suffer from depression (Pfoh et al., 2020). Identifying patients early with routine screening is necessary to provide treatment for depression and improve health outcomes. Educating patients on depressive symptoms can encourage self-reporting to help with their timely treatment (Taple et al., 2020). Creating an EHR alert can hopefully improve adherence to national guidelines as well as enhance the workflow process. This approach, in turn, can help alleviate the financial burden of morbidity and mortality for those patients with a BMI of 30 or greater who screen high on depression scales.

Theoretical/Conceptual Framework

A theoretical framework describes the relationship between variables and support interventions that align with a research study. The health belief model (HBM) developed by

Hockman Rosenstock in 1950 is widely used in research. The HBM was selected to guide this study in examining the relationship between integrating an EHR alert to screen patients with a BMI of 30 or greater and depression identification. The EHR alert was implemented to hopefully improve early identification and treatment of depression by establishing a standard workflow process.

The HBM has six assumptions on how individuals perceive their health and willingness to change behaviors: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Kebede et al., 2023). In this study, perceived susceptibility was related to a patient's belief that their BMI was associated with an increased risk for depression. Perceived severity was associated with the belief of developing comorbid conditions because of a BMI of 30 or greater and depression. Perceived benefits were identified through the integration of EHR alerts into patients' charts. This activity aimed to improve the providers' adherence to the standards of care. And screening patients with a BMI of 30 or greater for depression helps their early identification and treatment with psychopharmacology and psychotherapy, to improve outcomes. Perceived barriers included those stemming from both the patient and the provider. For example, a patient's fear of a depression diagnosis, embarrassment, and the financial cost of treatment could delay treatment. In addition, clinical visits may take longer, which providers may see as a barrier to treating patients diagnosed with depression. Cues to action were directly related to integrating the EHR alerts to improve the incidence of screening and identify those with a BMI of 30 or greater suffering from depression. Adding clinical reminders in a patient chart notified providers about potential patients with specific BMIs who needed to be screened for depression. The HBM also promotes self-efficacy. When EHR alerts notified healthcare providers to screen patients with a BMI of 30 or greater for

depression, providers were empowered to follow the standards of care. As a result, early identification and treatment of the health conditions lead to improved patients' outcomes.

Purpose, Clinical Question, Hypothesis

Patients with a BMI of 30 or greater may suffer from undiagnosed depression due to the lack of early identification and treatment when standards of care are overlooked. The purpose of this study was to examine if integrating an EHR alert into patients' charts increased the incidence of screening patients with a BMI of 30 or greater for early identification and treatment of depression. The clinical question for this study was: In patients with a BMI of 30 or greater, how does an EHR alert to screen for depression during a primary care visit affect early identification and treatment of depression? The following hypothesis was addressed: Alternative hypothesis H1: An EHR alert to screen patients with a BMI of 30 or greater for depression during a primary care visit affects early identification and treatment of depression. Null Hypothesis H0: An EHR alert to screen for patients with a BMI of 30 or greater for depression during a primary care visit does not affect early identification and treatment of depression.

The EHR notified providers to conduct routine depression screenings as per standards of care, which were necessary to identify patients with a BMI of 30 or greater with depression early and provide treatment. Early identification of depression in this study was measured using the PHQ-9. Several screening tools were available for early identification of depression, including the Beck Depression Index (BDI), Hamilton Depression Scale (HAM-D), and Geriatric Depression Scale (GDS). All these screening tools can help identify depression. However, the PHQ-9 questionnaire was a widely used screening tool for diagnosing depression and its severity (Ford et al., 2020), and it was considered a gold standard screening tool for identifying depression. Treatment for depression was captured by prescriptive modality:

psychopharmacology and psychotherapy. The objective behind implementing an EHR alert in primary care was to allow providers to screen for depression in individuals with a BMI of 30 or greater. This intervention aimed to allow providers to identify patients with depression early and improve their health outcomes.

Conceptual and Operational Definitions of Variables

For this project, the variables that were discussed included *body mass index (BMI), electronic health records (EHR),* and *depression.* These terms were utilized throughout the study to provide an understanding of how they related to the problem of identifying early depression by integrating an EHR alert system into a patient's chart.

A *body mass index* (BMI) is a person's weight in pounds divided by the square root of the height in inches to classify a normal body weight or obesity (Zierle-Ghosh, 2023). This classification allows patients to be assessed for increased risk of chronic illnesses, including heart disease, diabetes, or mental illness (Hill et al., 2017). Operationally, BMI can be measured objectively by calculating height and weight to identify individuals with a BMI of 18 to 24.9 or overweight with a BMI of 25 to 29.9 (Zierle-Ghosh, 2023). In this study, a BMI of 30 or greater was considered obesity.

An *electronic health record* (EHR) contains the digital health history of a patient's medical treatments, medications, and diagnosis and provides real-time information during patient encounters. EHRs are patient-centered and instantly make information available to providers with secure access (Upadhway & Hu, 2022). EHRs capture clinical workflow, log patient data, assess outcomes, and standardize clinical practice by capturing chronic illness and reducing delays in treatment. Most EHR systems are equipped to create best practice alerts, which, when designed, improve the delivery of healthcare services (Agency for Healthcare Research and

Quality [AHRQ], n.d.). An *EHR alert* is a technology-created notification (AHRQ, n.d., para. 2). During this project, an EHR alert was created and integrated into a patient's chart to remind providers to screen for depression in those patients with a BMI of 30 or greater.

Depression is a mental health disorder that causes low mood, persistent feelings of sadness, lack of motivation, and feelings of helplessness and hopelessness (Karrouri et al., 2021). The criteria from the Diagnostic and Statistical Manua of Mental Disorders (5th ed.) for diagnosing and rating the severity of major depressive disorders is based on five or more symptoms over two weeks, which included empty mood, lack of interest in pleasurable things, significant weight loss or gain, insomnia or hypersomnia, psychomotor agitation, feeling fatigued or feeling worthless. Depression is measured utilizing screening tools that look at scores based on symptoms that one is experiencing with depression. The goal of this study was to notify providers using an EHR alert to screen those patients with a BMI of 30 or greater for identification and treatment of depression.

Summary

In Chapter 1, the discussion addressed the need to implement an EHR alert to remind providers to screen patients with a BMI of 30 or greater for the early identification and treatment of depression. Utilizing the standard of care with screening tools such as PHQ-9 might have provided access to pharmacologic and non-pharmacologic treatment modalities earlier to those with a BMI of 30 or greater and suffering from depression (Arhi et al., 2021). The objective behind this project was to improve depression screening incidence as well as enhance adherence to standards of care as USPTF recommended. Chapter 2 offered a detailed review of the literature.

Chapter 2 Integrated Review of the Literature

This chapter offered a literature review concerning current research on screening patients with a body mass index (BMI) of 30 or greater for depression and utilizing an EHR alert to help with the early identification and treatment of depression in primary care. Obesity and depression have a close relationship; however, depression screening was often missed during patient-provider encounters in primary care settings (Waingberg et al., 2017). As a result, patients may struggle with comorbid-related illnesses, including mental impairments. Despite the recommendation from national organizations to screen for depression utilizing evidence-based tools in primary care, patients were still not being screened routinely and identified for mental health conditions including depression (Reynolds & Frank, 2016; Sinicalchi et al., 2020). Data from health and national nutrition surveys concluded a positive relationship between being overweight and depressed (Badillo et al., 2022). In one study, the PHQ-9 was utilized to identify patients with depression, and it was noted that about 61.5% of patients had depression and 50% of these patients also had a BMI of 30 or greater (Badillo et al., 2022).

This chapter presented a synthesis and integrative review of the literature related to the independent variable (EHR alert to screen for depression in those with a BMI of 30 or greater) and the dependent variable (early identification and treatment of depression). The chapter also included a review of theories to guide studies, a synthesis of the literature related to the study design, sample and data collection tools, and statistical analysis. The chapter ended with a discussion of major themes derived from the literature appraisal.

Search Criteria

A literature review was conducted to identify evidence on the effectiveness of EHR alerts in screening for depression in people with a BMI of 30 or higher and early identification and

treatment of depression. Research articles were obtained from the Cumulative Index to Nursing and Allied Health Literature (CINHAL) and National Institute of Health (NIH) databases. Keywords used to help locate relevant research articles included *depression screening, patient health questionnaire (PHQ-9), Body mass index (BMI), treatment,* and *electronic health record alert*. Boolean phrases AND, OR, NOT, or AND NOT helped narrow the search. The initial search generated 6,050 results from the NIH database and 6,068 results from the CINHAL. The initial search focused on depression, PHQ-9, EHR, and BMI. The search was narrowed to studies published between 2016 to 2023 in both databases, which yielded 383 and 153 studies respectively. Additional keyword searches were related to the implementation of tools to measure depression, obesity, symptoms of depression, depression treatment, EHR alert, provider, and lack of follow-up. Articles irrelevant to the search criteria were excluded, and 27 articles from both databases were analyzed and used in the following literature review. Additional articles were included for major themes identified in the literature that included EHR alert to screen, obesity measured by BMI of 30 or greater, characteristics of depression with a BMI of 30 or greater, depression treatment options, provider role, and the lack of follow-up care.

Synthesis of Literature

The following synthesis of the literature was performed to identify prevalent findings in the published scholarly literature. An analysis of 27 articles that met inclusion criteria was done and presented here. Major themes related to the clinical question and the variable of EHR alert for depression screening to improve early identification and treatment of patients with depression were discussed.

Independent Variable: EHR Alert to Screen for Depression in Patients with BMI of 30 or Greater

Twenty-seven were related to the independent variable EHR alerts to screen and BMI of 30 or greater. Of those, 16 articles focused on screening adults ages 18 to 60 years for depression (Arhi et al., 2021; Arrieta et al., 2017; Barzin et al., 2021; Behrens et al., 2020; Cumbe et al., 2020; Gluzek et al., 2020; Kendrick et al., 2017; Korczak et al., 2023; Liao et al., 2020; Martens et al., 2021; Maximiano et al., 2021; Molebatsi et al., 2020; Palm et al., 2014; Rosas et al, 2020; Siniscalchi et al., 2020; Smith et al., 2020). From those 16 articles, three articles revealed how EHR alert was used to prompt providers to screen patients for depressio utilizing the PHQ-9 questionnaire (Jeffery et al., 2021; Larson et al., 2022; Siniscalchi et al., 2020).

Implementing EHR alerts into patients' charts allowed the reorganization of workflow within primary care settings, improved patient outcomes (Jeffery et al., 2021; Larson et al., 2022; Siniscalchi et al., 2020). Frontline managers played an active role in designing successful EHR alerts and ensured provider buy-in (AHCR, n.d.). Comprehensive training for staff to used EHR alerts to screen for healthcare conditions, including depression, could become an institutional incentive program for primary care providers.

Out of 27 articles, 10 articles discussed the link between BMI and depression. In these studies, BMI was identified as an essential factor for patients looking to make changes to improve their body image and thus improve depression treatment (Arhi et al., 2021; Behrens et al., 2020; Bell et al., 2019; Bosc et al., 2022; Kohler et al., 2020). Studies categorized a BMI of 25 to 30 as overweight, and BMIs above 30 are considered obese (Hill et al., 2017). The association between depression and obesity is noted not only among non-pregnant individuals but also in pregnancy as depression fluctuates during the perinatal period (Wilson et al., 2020).

According to Rutherford et al. (2022), there was a positive relationship between increased physical activity, decreased BMI, and decreased depression symptoms. A cross-sectional survey was completed with 10,047 participants over the age of 20 years (Rutherford et al., 2022). The National Health and Nutritional Examination Survey (NHANES) combined with the PHQ-9 survey was implemented to study the relationship between physical activity, BMI, and depression (Rutherford et al., 2022). This study found that increased BMI was associated with depression (Rutheford et al., 2022). This study reinforced the need for early identification of obese BMIs and depression in patients for effective interventions and positive patient outcomes. Bell et al. (2019) also conducted a cross-sectional survey utilizing the NHANES and PHQ-9. This study found that race and income had different impacts on obesity and depressive outcomes (Bell et al., 2019).

Dependent Variable: Identification and Treatment of Depression Using Screening Tools

Twenty-seven articles identified depression as a serious healthcare concern. Depressive conditions, such as major depressive disorders (MDD), were frequently diagnosed in primary care clinics (Lech et al., 2022). Symptoms of depression may be self-reported as self-dysfunctional behaviors such as poor eating habits, physical inactivity, and dissatisfaction with relationships and quality of life (Behrens et al., 2020; Kohler et al., 2020; Rutherford et al., 2022). However, diagnosing patients with depression continues to be a diagnostic challenge in primary care settings. EHR alert implementation could increase use of the PHQ-2 and or PHQ-9 screening tools. Rudisill et al. (2016) discussed the relationship between a BMI of 30 and the comorbidity of depression. An EHR alert was used to analyze the correlation among obesity and depression and healthcare costs, and it was concluded that the benefits of using EHR alerts or

other alert notifications for early identification and treatment of depression in obese patients was beneficial (Rudisill et al., 2016).

Treatment for depression improved mental health and overall wellbeing. Martens et al. (2021) noted improvement in depressive symptoms up to two years post-bariatric surgery. Pasi et al. (2023) provided comprehensive data about the postoperative bioavailability of selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs). The authors found that the patients who had bariatric surgery had decreased SNRI/SSRI levels (Pasi et al., 2023). Thus, this study indicated the importance of monitoring SNRI/SSRI drug levels. Pasi et al. (2023) also discussed that most patients who have had gastric bypass surgery required increased doses of antidepressants due to alterations of gastrointestinal anatomy and increased absorption of long-acting medications. However, Palm et al. (2014) indicated that "BMI was not correlated with depression in clients' post-bariatric surgery" (p. 367) in their study.

A review of the literature on depression screenings indicated that depression was a current issue that was debilitating to individuals. The standard of care had been established to screen patients with obesity to help identify those with depression (Carroll et al., 2020). Providers play a pivotal role in reinforcing the standards of care and screen for depression for those patients who presented to primary care visit with BMI of 30 or greater.

Screening Tools for Depression

Out of the 27, 13 articles discussed using the PHQ-9 as a screening tool for depression and established it as a gold standard (Arrieta et al., 2017; Behrens et al., 2020; Bell et al., 2019; Barzin et al., 2020; Cumbe et al., 2020; Gluzek et al., 2020; Kendrick et al., 2017; Kohler et al., 2020; Korczak et al., 2023; Martens et al., 2021; Molebatsi et al., 2020; Rutherford et al., 2022;

Siniscalchi et al., 2020). A review of the literature on screening tools identified that utilization of PHQ-9 was reliable for screening and early identification of depression. Screening that included the PHQ-9 tools identified individuals with depression based on psychometrics scores allowed providers to identify patients with depression early and provide appropriate treatments (Carroll et al., 2020).

Other screening tools for depression were also utilized in the literature included the PHQ-2, which was a shorter questionnaire form with only two questions. This tool was often used for quick screening for depression in comparison to PHQ-9 and the Beck Depression Index (BDI). The BDI was a self-reporting tool that consisted of 21 questions to assess the severity of depression (Arrieta et al., 2017; Barzin et al., 2020; Kendrick et al., 2017; Liao et al.,2020; Pasi et al., 2023; Smith et al., 2020). Implementing Vital Sign Six as a quality improvement for early identification of depression provided practitioners with evidence-based practice tools to identify patients who need depression management or referrals for treatment (Siniscalchi et al., 2020). Screening tools were important elements in identifying depression and evaluating therapy needs in a timely manner.

Theories Used to Guide Studies

Theoretical and conceptual frameworks helped to guide and draw conclusions during a research study. In the reviewed literature, only a few articles included discussions related to theoretical or conceptual frameworks. Gordon et al. (2021) used the health action process to assume that individuals changed their behaviors when they perceived their health as a threat. In this model, the authors established two phases that must happen before behavioral changes occur: motivation and volition (Gordon et al., 2021). In the motivational phase, the intent towards healthy behavior was developed, which led to the decision to seek medical care (Gordon

et al., 2021). Treatment was considered in adopting positive behaviors and looking at outcomes while balancing the benefits and the costs. Outcome expectancy could be social, emotional, and physical (Gordon et al., 2021). In the volition phase, "the behavior is planned, prepared, and executed", which leads to motivational self-efficacy in implementing change, coping, maintaining health, and continuing optimistic beliefs of engaging in targeted behaviors" (Gordon et al., 2021, para. 5). Blackstone et al. (2022) described their quality improvement initiative that increased depression screening in primary care settings. The initiative included a Plan-Do-Study-Act (PDSA) conceptual framework. The PDSA model was used to implement a standardized workflow for depression screening and guide collaborative efforts with health information technology and prompted providers to perform depression screening, delivered educational materials, and conducted follow-up education (Blackstone et al., 2022). In the other 25 studies, theoretical or conceptual frameworks were not discussed.

Study Designs Discussed in the Literature

Quantitative methods were found to be preferred in 19 of the reviewed research studies (Arrieta et al., 2017; Barzin et al., 2021; Bell et al., 2019; Berardi et al., 2022; Cumbe et al., 2020; Hill et al., 2017; Kendrick et al ., 2017; Kohler et al ., 2020; Kim et al., 2020; Liao et al., 2020; Majd et al., 2021; Martens et al., 2021; Maximiano et al., 2021; Molebatsi et al., 2020; Palm et al., 2014; Pasi et al ., 2023; Reges et al., 2018; Rosas et al ., 2020; Rutherford et al., 2022; Sumithran et al., 2023). Six articles used the qualitative method (Arhi et al., 2021; Behrens et al., 2020; Bosc et al., 2022; Gluszek et., 2020; Malpass et al., 2016; Smith et al., 2020). One article used a mixed methodology (Gordon et al., 2020). Siniscalchi et al. (2020) conducted a quality improvement study. Randomized control trial studies were noted in the literature review and were also utilized (Arrieta et al., 2017; Kendrick et al., 2017). A quality improvement study

was conducted by Gordon et al. (2020). A nested-control study was conducted by Arhi et al. (2021). Randomized control studies were superior in identifying inferences compared to the qualitative research and mixed-method studies due to the reduction of bias. Fourteen articles were Level II evidence according to the Johns Hopkins Evidence-Based Practice Nursing Model (JHEBNP), and 13 articles were Level III.

The literature was analyzed to identify any similarities in design. A cross-sectional design was used in eight studies (Bell et al., 2019; Berardi et al., 2022; Hill et al., 2017; Kohler et al., 2020; Liao et al., 2020; Martens et al., 2021; Molebatsi et al., 2020; Rutherford et al., 2022). Differences in the designs included a longitudinal qualitative design (Behrens et al., 2020; Malpass et al., 2016; Smith et al., 2020), cohort designs (Bosc et al., 2022; Kim et al., 2020; Palm et al., 2014), and prospective cohort designs (Arhi et al., 2021; Barzin et al., 2020; Pasi et al., 2023). Three studies were randomized control trials (Arrieta et al., 2017; Kendrick et al., 2017; Madj et al., 2021). Retrospective designs were used in four studies (Gluszek et al., 2020; Reges et al., 2018; Sumithran et al., 2023; Siniscalchi et al., 2020). The structured multiphase fast process led by a team of bilingual experts was followed in the study by Cumbe et al. (2020). There were similarities and differences in the design of the studies discussed above, which provided a wealth of research opportunities.

Samples Discussed in the Literature

The sample sizes varied across the reviewed studies. About five out of 27 studies included samples of less than 100 subjects (Bosc et al., 2022; Behrens et al., 2020; Kendrick et al., 2017; Malpass et al., 2016; Pasi et al., 2023; Maximiano et al., 2021). Seven articles utilized a larger sample size ranging from 100 to 700 participants (Arrieta et al., 2017; Barzin et al., 2020; Berardi et al., 2022; Cumb et al., 2020; Gluszek et al., 2020; Kohler et al., 2020; Majd et

al., 2021; Molabetsi et al., 2020; Palm et al., 2014). However, even larger samples were used in about six articles out of the 27 with sample sizes ranging from 1,200 to 4,500 (Arhi et al., 2021; Bell et al., 2019; Kim et al., 2020; Liu et al., 2023; Martens et al., 2021; Smith et al., 2020; Wilson et al., 2020). Five articles had even larger sample sizes ranging from 10,000 to 120,00 participants (Hill et al., 2017; Liao et al., 2020; Reges et al., 2018; Rutherford et al., 2022; Sumithran et al., 2023).

Notably, there were similarities in settings; many researchers used outpatient primary care clinics (Cumbe et al., 2020; Kendrick et al., 2017; Malpass et al., 2016; Siniscalchi et al., 2020). Arrieta et al. (2017) and Cumbe et al. (2020) shared similar settings in different countries. Arrieta et al. (2017) conducted the study in rural areas with Spanish-speaking females in Mexico. Cumbe et al. (2020) conducted a study in East Africa and included female participants with a mean age of 28 years. However, the two studies excluded younger and older populations. Gordon et al. (2020) utilized a different web-based approach, which modified the settings to electronic technologies. The inclusion criteria in that study were the initial evaluation for depression utilizing PHQ-9 and a follow-up to evaluate psychometric scores. Recurrent findings in the literature included screening patients with obesity for depression in outpatient settings (Rosas et al., 2020; Liu et al., 2023).

Data Collection Tools Discussed in the Literature

About 18 articles out of 27 included validated tools to screen patients with depression. Three used the PHQ-2 (Arrieta et al., 2017; Liao et al., 2020; Siniscalchi et al., 2020). Twelve articles used the PHQ-9 screening tool (Arrieta et al., 2017; Behrens et al., 2020; Bell et al., 2019; Cumbe et al., 2020; Kendrick et al., 2017; Köhler et al., 2020; Madj et al., 2021; Malpass et al., 2016; Molebatsi et al., 2020; Siniscalchi et al., 2020; Rosas et al., 2020; Rutherford et al.,

2022). Four articles used the BDI (Barzin et al., 2020; Kendrick et al., 2017; Pasi et al., 2023; Smith et al., 2020). One article used the PHQ-8 (Martens et al., 2021). Two articles used the World Health Organization Quality of Life (WHOQL) BREF scale (Arriett et al., 2017; Molebatsi et al., 2020). These same two articles combined multiple screening tools for depression (Arrieta et al., 2017; Molebatsi et al., 2020). Martens et al. (2021) utilized the PHQ-8 to screen depression in patients who underwent gastric bypass surgery two years prior to the study. These researchers excluded the PHQ-9 item related to suicidal ideation due to the inability to thoroughly assess or quickly intervene if suicide was reported (Martens et al., 2021). Depression screening using PHQ-9 was commonly used in literature, and it was considered a reliable tool.

Another study implemented VitalSign6, a web-based application to administer depression questionnaires on an iPad in both English and Spanish (Siniscalchi et al., 2020). VitalSign6 could be used as a standard tool for providers to capture the severity of depression, side effects, and medication effectiveness, such as antidepressants, behaviors, and adherence programs to ensure patients were treated appropriately (Sinsicalchi et al., 2020). Again, the PHQ-9 was established as the gold standard for screening and initiation of treatment for depression (Siniscalchi et al., 2020).

Multiple studies discussed the need for recurrent depression screenings using validated tools (Arrieta et al., 2017; Behrens et al., 2020; Kendrick et al., 2017; Kohler et al., 2020; Malpass et al., 2016; Molebatsi et al., 2020). The PHQ-9 was found to be a valuable tool for practitioners in primary care clinical settings to identify depression. The implementation of screening tools in a primary care setting with patients presenting with a BMI of 30 or greater improved the patient's quality of life.

Data Analysis Discussed in the Literature

A common finding of the 27 articles was the use of descriptive statistics with calculated means and standard deviations. The mean BMI for men in the appraised studies was slightly higher than that of females, with a mean of 47.9. The mean standard health care cost with or without mental health disorders during six months before gastric bypass surgery was $11,314 to $6,847, the mean medical cost was $8,438, with or without mental illness, and the mean medication cost six months before surgery was $2,875 annually (Kim et al., 2020). The mean standard deviation for BDI scores ranged from 5.5 to 9.7 pre-surgery (Smith et al., 2020). Descriptive statistics were used to measure the number of patients screened positive to the total number of unique patients (Siniscalchi et al., 2020). The clinical outcome measured changes in patients' baseline and follow-up self-reported PHQ-9 scores.

Different inferential statistical tests were used in the studies analyzed in this literature review. A paired *t*-test was used to compare the baseline of mean scores and follow-up scores (Arrieta et al., 2017; Gluszek et al., 2020; Molebasti et al., 2020; Siniscalchi et al., 2020; Smith et al., 2020). ANOVAs were applied to assess the differences among several variables, including depression and obesity (Bell et al., 2019; Barzin et al., 2020; Berardi et al., 2022; Bosc et al., 2022; Hill et al., 2017; Liao et al., 2020; Palm et al., 2014; Pasi et al., 2023; Smith et al., 2020; Sumithran et al., 2023). Pearson correlation chi-square tests were used and analyzed the relationship between weight loss and depressive symptoms (Behrens et al., 2020; Rosas et al., 2020; Martens et al., 2021).

The consistent utilization of the PHQ-9 yielded high reliability identified patients with depression based on psychometric scores. The overall descriptive mean for PHQ-9 was 6.29, with a standard deviation of 5.47, $p < 0.01$ (Arrieta et al., 2017; Behrens et al., 2020; Martens et

al, 2021; Palm et al., 2014). One qualitative study had no descriptive or inferential statistics, and reliability or validity was not included. (Malpass et al., 2016). One hundred five participants fulfilled the DSM-V criteria for major depression using the gold standard mini-depression model that corresponded to a prevalence of 40.9% (Köhler et al., 2020; Ruthford et al., 2022). All articles provided promising statistical results. The prevalent findings in all articles concluded the use of PHQ-9 as a reliable screening tool for identifying depression.

Major Themes

Challenges and Benefits of EHR Alerts

Over the last 60 years, EHRs have evolved to improve patient care and clinical system support (Ng et al., 2023). EHRs were first introduced to healthcare in 1962 but were only used by government agencies due to the cost. In 1972, more hospitals used EHRs mainly for patient billing, patient scheduling, and patient health information (Honavar, 2020). In 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act implemented meaningful use for the coordination of patient care and to improve health disparities (Modi & Feldman, 2022). Today, many hospitals have adopted EHRs for quality improvement in patient care.

An EHR is a central system that provides access to a comprehensive clinical history of clients' diagnoses, procedures, and treatments before they are seen (Upadhyay & Hu, 2022). Cerner, Epic, and Meditech are some of the more popular EHR systems and were used in both inpatient and outpatient settings to improve quality outcomes (Beauvais et al., 2021). Before utilizing an EHR system, proper implementation strategies should be addressed to ensure success, prevent delays, and protect patient information. The EHR was meant to assist providers in evidence-based decision-making and help streamline provider workflow for efficient

coordination of patient care. Recent studies showed that utilization and meaningful use of EHRs could be required to ensure the benefits of use, which lead to provider usage behaviors (Upadhyay & Hu, 2022). Clinical support tools integrated into EHR improved the quality of care in clinical settings, such as alerts (Chen et al., 2023).

Providers understand the importance of EHRs in avoiding medical errors by improved accessibility and readability of patient information (Upadhyay & Hu, 2022). EHRs have made communication among clinicians, other disciplines, and patients more effective (Upadhyay & Hu, 2022). The use of EHRs may have caused interference between patients and providers, as EHRs could take too much time away from patient encounters due to documentation requirements (Upadhyay & Hu, 2022). Some providers felt EHRs slowed them down as some specialists required much more detailed documentation and less patient engagement, which may have led to burnout (Agency for Healthcare Research and Quality [AHRQ], n.d.; Upadhyay & Hu, 2022). EHRs should be designed to be user-friendly and to prevent data entry errors, thereby reducing provider burden (AHRQ, n.d.; Upadhyay & Hu, 2022). Overall, when an EHR alert is added to the software, it triggers a pop-up notification. In this study, the EHR alert was triggered when a patient had a BMI of 30 or greater. This alert notified providers to screen patients for depression using the PHQ-9. Early identification and treatment of depression in real-time encouraged communication between patient and provider regarding treatment, safety, and quality of care (Pfoh et al,2020).

Technology-generated notifications, such as EHR alerts, helped improve clinical decision-making and influence treatment choices (AHRQ, n.d.). EHR alerts also prompted providers to screen for different health conditions when time constraints and lack of resources create opportunities for breaching standards of care. Quality patient care improved with the

utilization of EHR notifications (AHRQ, n.d.). Challenges of using EHR alerts included time constraints, alert fatigue, and overload, taking away time from patient interaction, and different EHRs being used across the U.S. (AHRQ, n.d.; Upadhyay & Hu, 2022).

Research concluded the benefits of EHR alerts in clinical trials, including pre-screening patients electronically versus manually for their eligibility to participate in studies (Ma et al., 2020). This approach has allowed providers to refer subjects and provided resources regarding clinical studies (Ma et al., 2023). Ma et al. (2023) discussed the importance of EHR alerts and identified patients who would benefit from conversations about advanced care planning based on a scoring procedure. Another study examined the impact of an EHR alert for identifying patients with acute kidney injury using an acute injury algorithm that automatically assessed the patient record for inclusion and exclusion criteria (Wilson et al., 2021). Alerts were displayed each time a provider opened the chart and implemented order sets that included urine, blood, and kidney imaging (Wilson et al., 2021). EHR alerts were valuable tools in early treatment identification of health conditions, leading to improved patient outcomes.

Evidence-Based Tools for Early Identification of Depression

There are different tools available to healthcare providers for depression screening. The USPSTF recommended screening for depression in primary care utilizing evidence-based tools (Reynolds & Frank, 2016; Siniscalchi et al., 2020). Approximately 18 articles included validated tools to screen patients for depression. Of the 27 articles, three used PHQ-2 (Arrieta et al., 2017; Liao et al., 2020; Siniscalchi et al., 2020;). Twelve articles used PHQ-9 screenings (Arrieta et al., 2017; Behrens et al., 2020; Bell et al., 2019; Cumbe et al., 2020; Kendrick et al., 2017; Köhler et al., 2020; Madj et al., 2021; Malpass et al., 2016; Molebatsi et al., 2020; Siniscalchi et al., 2020; Rosas et al., 2020; Rutherford et al., 2022). Four articles used Beck’s depression index (Barzin et

al., 2021; Kendrick et al., 2017; Pasi et al., 2023; Smith et al., 2020). One article used PHQ-8 (Martens et al., 2021). Two articles used the WHOQOL- BREF scale (Arrieta et al., 2017; Molebatsi et al., 2020). However, two articles used multiple screening tools for depression (Arrieta et al., 2017; Molebatsi et al., 2020).

A pre- and post-designed questionnaire was used to evaluate the effectiveness of any changes in screening outcomes. Primary care providers screened patients with PHQ-9 tools for standard measures and systemic assessment of symptom severity, antidepressant side effects, behaviors, and adherence to treatment that used algorithm-based dosing with decision support and consultation (Siniscalchi et al., 2020). With the implementation of Vitalsign6, patient history of depression and antidepressants was documented within the EHR, which allowed providers to continue to screen for depression on subsequent follow-up visits that improved patient outcomes and healthcare delivery (Siniscalchi et al., 2020). Different screening tools exist for providers in clinical settings to improve clinical decision-making and diagnostic reasoning.

Obesity Measured by BMI and Treatment Options

Obesity is commonly identified using BMI categories where a BMI of 30 or greater is considered obese. Obesity is further subdivided into “class 1: BMI of 30 to < 35, class 2: BMI of 35 to < 40, [and] class 3 or severe obesity: BMI of 40 or higher” (Centers for Disease Control and Prevention [CDC], 2022, para. 2). BMI is a screening tool for defining overweight and obesity, and it is not a measurement of health status (CDC, 2022).

Sociodemographic factors that have influenced obesity include age, gender, race, ethnicity, and females; further, females with obesity were more likely to also suffer from depression (Zhang, 2021). In one study, a negative association was noted between age and body weight for those suffering from depression, and the risk for obesity increased among those with

low education and unemployment (Zhang, 2021). Racial and ethnic disparities in obesity prevalence were common among Hispanics, non-Hispanic Whites, and non-Hispanic Black or African American men, and these disparities also increased the risk for other healthcare concerns and healthcare costs (Hill et al., 2017). The relationship between race, ethnicity, and obesity among Hispanic and non-Hispanic men was more prevalent in men born in the United States than outside of the United States (Hill et al., 2017). Lower-income, education, poor health, and smoking are also factors that increased the incidence of obesity development (Bell et al., 2019; Hill et al., 2017; Liu et al., 2023).

Obesity Treatment Options

Interventions focused on leisure time and physical activity appeared to improve depression and obesity (Wilson et al., 2020). However, more research and intervention studies are needed to confirm the findings (Rutherford et al., 2022). Gluszek et al. (2020) suggested that lifestyle changes in diet, physical activity, and psychotherapy to improve obesity were not enough, suggesting gastric bypass surgery improved obesity, thereby improving depression. In their study, pre- and post-bariatric surgery BMI significantly decreased after 24 months from 47.8 (SD = 8.5) to 36.8 (SD = 36.8), $p < 0.001$ (Gluszek et al., 2020).

Individuals who completed at least 150 minutes per week of leisure physical activity had significantly fewer depression symptoms than those who completed less than 150 minutes per week (Karrouri et al., 2021). Physical activities improved blood glucose, triglycerides, and leptin levels (Berardi et al., 2022; Gluszek et al., 2020; Wilson et al., 2020). The American Psychiatric Association, Royal Australian, and New Zealand College recommended that individuals who are depressed exercise regularly to prevent worsening their symptoms (Karrouri et al., 2021).

There was a need to focus on psychological interventions in aftercare regimens for bariatric surgery. This care included the need to identify patients struggling with depression by utilizing standardized depression screenings (Behrens et al., 2020; Bosc et al., 2022; Berardi et al., 2022; Ganga, 2023; Gluszek et al., 2020; Martens et al., 2021; Kim et al., 2020; Rosas et al., 2020; Palm et al., 2014). One study showed mortality rates related to cardiovascular disease and diabetes decreasing by 72% post-bariatric surgery, and suicide rates were 2.4 times higher in the non-surgery group; hence, more aggressive screening is needed during the pre- and post-surgery and follow-up (Ganga, 2023). Palm et al. (2014) used the PHQ-9 to screen for psychological disorders and psychiatric examinations as part of pre-surgery assessment procedures. In that study, the authors found that BMI was not related to depression. However, most authors concluded that obesity and depression have a bidirectional relationship, so the standard of care should be reinforced, including screening to identify depression early (Zhang, 2021). Early identification of depression screening could help lessen the healthcare burden for those with a BMI of 30 or greater.

Types of Bariatric Surgery

Gastric bypass surgery (GBS) is a common procedure that helps with weight loss and obesity management. GBP was first developed in 1960 after discovering partial gastrectomy for those with peptic ulcer disease had weight reductions (Seeras et al., 2023). There are anatomical changes in the stomach and the small intestines in how the body absorbs food and other nutrients (Telem et al., 2023). Weight loss was achieved by limiting the amount of food the stomach can hold, thereby decreasing the number of nutrients and calories that are absorbed by the body. In addition, the hormonal changes in the stomach made an individual feel fuller longer and decrease the risk for obesity (Telem et al., 2023). GBS helped to sustain weight loss for those individuals

with class II obesity (BMI 30 but less than 39) and class III obesity (BMI greater than 40). The American Society for Metabolic and Bariatric Surgery estimated that in 2017, 228,000 people in the United States and worldwide 558,000 underwent GBS (Telem et al., 2023).

There are different types of bariatric surgeries for weight loss: laparoscopic Rouxen-Y-gastric bypass is achieved by the highly variable intervention (Telem et al., 2023). The procedure remains the gold standard and works by restricting food intake and limiting the number of nutrients absorbed, bypassing the duodenum and the distal stomach, decreasing hunger, and reducing ghrelin as well as increasing satiety with high leptin levels (Telem et al., 2023). Rapid weight loss is anticipated over the first few months post-operation and then plateaus over the next year to a year and a half. Most patients lost approximately five to seven pounds post-procedure and averaged about 10 to 15 pounds of weight lost monthly (Telm et al., 2023).

Laser Rouxen-Y-gastric bypass (RYBG) complications included a severe but rare post-gastrointestinal leak and stomal stenosis that affects the ability to swallow. This complication can occur early post-operation (Telm et al., 2023). Late complications included marginal ulcers and gastric fistulas, which can develop within the gastric pouch, internal hernia, and small bowel obstructions (Telem et al., 2023). Those complications occurred at any time post-RYGB. Dumping syndrome was typical, and it is estimated that approximately 50% of patients can experience the syndrome after eating a meal high in simple carbohydrates; symptoms included crampy diarrhea, sweating, and heart palpitations (Telem al., 2023). Approximately 42% of patients experienced symptoms of low blood sugar, and treatment included reversal of RYGB (Telem et al., 2023). Psychosocial impairment is another complication. Patients may suffer from depression that goes untreated, which has led to negative coping, alcohol and substance abuse,

eating disorders, difficulty with maintaining employment, and even suicide (Telem et al., 2023). Follow-up care with a patient's post-bariatric surgery was imperative to assess mental health.

Laparoscopic sleeve gastrectomy (LSG) was a more commonly performed procedure. In the United States, approximately 123,000 LSGs were performed in 2020 (Rosenthal et al., 2023). Indications for LSG surgery included having a BMI greater than 40 with or without comorbidities or a BMI 30 to 35 with comorbidities, including heart disease, hypertension, diabetes mellitus, and obstructive sleep apnea (Rosenthaul et al., 2023). The procedure involves resecting the curvature and the fund of the stomach, and about 80% of the stomach is removed (Rosenthaul et al., 2023). LSG led to excellent weight loss that has the potential to occur rapidly over the first few months and then continued over the next year and a half before plateauing (Rosenthal et al., 2023). The hormone ghrelin is responsible for stimulating appetite; however, when the hormone is altered during the procedure, appetite is suppressed, and weight loss is achieved (Rosenthaul et al., 2023).

Side effects of LSG included risk for bleeding, usually found in the curvature of the fundus stomach (Rosenthaul et al., 2023). Strictures were another potential complication that can occur acutely post procedures and were found to be mechanical from bougie stapling or functional from hematomas or hematomas at the staple line, which caused food intolerance and difficulty swallowing (Rosenthaul et al., 2023). Gastroesophageal disease or worsening of pre-existing and portal vein thrombosis were also complications (Rosenthaul et al., 2023). Gastrectomy sleeves could be an inpatient or outpatient procedure (Martens et al., 2021; Reges et al., 2018; Rosenthal et al., 2023).

Biliopancreatic diversion with duodenal switch (BPD/DS) was another bariatric surgery and is performed for those patients with a BMI of 50 or greater or for weight recidivism after

other procedures (Telem et al., 2023). This procedure involves removing the pylorus, dividing the ileum, and then creating anastomose in the stomach (Telem et al., 2023). The DS included sleeve gastrectomy with preservation of the pylorus. Weight loss is achieved with this procedure based on a combination of restriction and malabsorption and alternating hormone production. This procedure provided the most weight loss but also had the potential for the most complications (Telem et al., 2023). The expected weight loss with this technique is 70% to 80% or 40% of total body weight. In a retrospective longitudinal study, outcomes on the bariatric database from 2007 to 2010 reported more significant weight loss over 12 months than with RYBG (Telem et al., 2023). Bariatric surgery was beneficial for patients who have had GBS (Behrens et al., 2020; Bosc et al., 2022; Gluszek et al., 2020; Kohler et al., 2020; Martens et al., 2021; Reges et al., 2018).

Psychosocial changes following bariatric surgery positively correlated with weight loss and image satisfaction (Kohler et al., 2020). Integrated multidisciplinary care for those with obesity and depression improved their overall quality of life (Rosas et al., 2020). Continued patient education and support were needed for healthy lifestyle changes with dietary consumption, including smaller meals, avoiding emotional eating, and maintaining a healthy weight (Rosas et al., 2020). Ongoing support from psychotherapy was necessary to teach positive coping skills around food consumption (Rosas et al., 2020).

Characteristics of Depression Symptoms in Patients with BMI of 30 or Greater

Five articles out of 27 discussed the characteristics of patients with depression. Some of those characteristics were poor sleep quality, inactivity, poor body image, low income, low education, impairment of workability, poor relationship satisfaction, dysfunctional eating behaviors, high alcohol use, smoking, and suicidal ideation (Köhler et al., 2020; Liao et al.,

2020; Rutherford et al., 2022; Sumithran et al., 2023). Patients who undergo GBS had malabsorption from anatomical and physical alterations, which can affect the bioavailability of antidepressants (Pasi et al., 2023).

There is consistent evidence that psychotropic medications were associated with weight gain. Perioperative lithium toxicity and SSRI withdrawal syndrome were also of concern, as well as post-pharmacological changes. Pasi et al. (2023) conducted a study that sought to compare pharmacokinetics and selective serotonin reuptake inhibitors (SSRI) and serotonin and norepinephrine reuptake inhibitors (SNRI) in individuals who were morbidly obese undergoing GBS. The findings showed that plasma concentrations dropped significantly by 25% during the first week, then decreased in four weeks post-bariatric surgery (RYGB or SG) and further decreased in six months of follow-up to about 75% preoperative concentration. The study further hypothesized that SSRI and SNRI correlated to depressive symptoms in obese patients undergoing GBS. Bariatric surgery improved health-related problems, such as sleep apnea, joint pain, hypertension, diabetes, and polycystic ovarian syndrome, with menstrual-related issues, anxiety, and depression (Alshammari et al., 2020). A psychiatric evaluation should be conducted on all patients who have undergone GBS to reduce negative postoperative outcomes (Alshammari et al., 2020). In conclusion, patients suffering from depression often lack motivation, have no energy, feel fatigued, and have less physical activity, which leads to weight gain and obesity.

Depression Treatment Options

The most complex mental illness to manage is depression, despite many treatment modalities for symptom relief. The goal of treatment for patients with acute depression was to

achieve remission and return to a stable baseline (Karrouri et al., 2021). There were several treatment options for those struggling with depression.

Pharmaceutical Treatment

The standard of practice for treating depression was pharmacologic management and choosing medications with the most minor side effects. SSRIs were usually the first line of therapy with good tolerability (Karrouri et al., 2021). However, SSRIs had the potential for bothersome side effects, including nausea, diarrhea, irritability, insomnia, and sexual dysfunction (Karrouri et al., 2021).

There are many other classes of antidepressants, such as monoamine oxidase inhibitors (MAOIs). MAOIs were the first drugs defined as antidepressants. Each MOAI had many side effects, that included hepatotoxicity and hypertensive crisis that led to lethal intracranial hemorrhage (Karrouri et al., 2021). Dietary restrictions also limited the use of this medication, which is now used as a last resort when other pharmacological treatments have failed (Karrouri et al., 2021). MOAIs were effective in reducing reactive moods. However, SNRIs are preferred over failed SSRIs (Karrouri et al., 2021).

Other antidepressants, including trazodone, caused a placebo effect. However, these medications were often used as a hypnotic for sleep (Karrouri et al., 2021). Bupropion is a norepinephrine dopamine reuptake inhibitor that was more tolerable than SSRI as it caused minimal weight gain and sexual dysfunction (Karrouri et al., 2021). Other antidepressants known to block serotonin included Trintellix and Viibryd, and they had fewer sexual side effects (Karrouri et al., 2021). Ketamine is an intravenous subtype of anesthetic that produced sustained glutaminergic stimulation; the medication had a quick effect on resistant depression and suicidal ideation and lasted for several days before eventually waning (Karrouri et al., 2021). Common

side effects of ketamine included dissociation, nephrotoxicity, urological dysfunction, dizziness, nausea, and vomiting (Karrouri et al., 2021).

Non-Pharmacological Treatment

Psychotherapy treatment was often used in combination with antidepressants to treat depression. Different psychotherapy techniques were utilized, including cognitive behavioral therapy (CBT) and interpersonal therapy (IPT). CBT is one of the most effective psychotherapeutic treatments for depression; this treatment is based on modifying dysfunctional behaviors, and most guidelines recommend it as a first line of treatment (Karrouri et al., 2021). IPT, on the other hand, identified triggers for depression, such as isolation, loss, or difficulty with social interactions (Karrouri et al., 2021). IPT and CBT were the first line of treatment for those struggling with mild or moderate depression (Karrouri et al., 2021).

Somatic treatment with the use of electronic convulsion therapy (ECT) was primarily used for resistant depression. The evidence supports the efficacy and safety use of ECT on patients with depression (Karrouri et al., 2021). There was much stigma around using ECT, and was often a last resort for treatment (Karrouri et al., 2021). ECT was utilized for patients who are severely depressed and have active suicidal tendencies (Karrouri et al., 2021). Trans-magnetic stimulation treatment (TMS) affects brain metabolism and was widely used in research on depression (Karrouri et al., 2021). Vagus nerve stimulation (VNS) treatment has been used to treat unilateral and bipolar depression for over 16 years (Karrouri et al., 2021). The procedure involved the implantation of a pacemaker underneath the collar bone and the electrodes connected to the left side of the vagus, which was selected due to fewer cardiac side effects (Karrouri et al., 2021). Lux therapy was intense light exposure of 2500 lux for two hours per day that helped treat seasonal and non-seasonal depression (Karrouri et al., 2021). Depression

continued to be a complex and challenging illness and was debilitating for most patients. Finding the best treatment options, either single use of medication or non-pharmacological modality or combination of treatments, was necessary to combat and treat depression and achieve remission.

Role of Providers in Identifying Depression

Healthcare providers played a critical role in early identification and treatment of depression. In one research study, Zhang (2021) found a bidirectional association between body weight and depression as those females who were obese were more likely to suffer from depression. The author advocated for targeted interventions to combat obesity and asserted clinical providers should pay special attention to the female population as their risk for obesity was higher than in males. Ganga (2023) also advocated for more aggressive pre- and post-surgery depression screening among patients ages 18 to 34 years as their suicide rates were 2.4 times higher post-bariatric surgery despite seeing decreases in cardiovascular, cancer, and diabetes complications. Providers should regularly screen for depression utilizing the PHQ-9 to monitor the severity of depression. (Behrens et al., 2020; Kendrick et al., 2017; Majd et al., 2021; Molebasti et al., 2020; Rutherford et al., 2022;). The United States Preventative Services Task recommended screening for depression in primary care and utilizing evidence-based tools (Reynolds & Frank, 2016; Siniscalchi et al., 2020). Providers who diagnosed and administered measurement-based care to patients had a statistically significant decrease in self-reported depression scores in one study (Siniscalchi et al., 2020). An EHR alert system could help providers identify patients with depression and provide treatment earlier (Jeffery et al., 2021; Siniscalchi et al., 2020).

Lack of Follow-Up

Four articles out of twenty-seven addressed challenges in following up with patients with obesity and depression. In a randomized control study, participants experienced significantly greater obesity-specific problems, mental health-related quality of life, sleep disturbance, and functional disability at six months but not at twelve months (Rosas et al., 2020). Thus, follow-up care was critically important after the diagnosis of depression in obese patients. Providers could use evidence and measurement-based care (MBC) programs, such as VitalSign6, to improve the referral for psychotherapy in patients suffering from obesity and depression. VitalSign6 software utilized a web-based application to administer depression questionnaires in both English and Spanish, which allowed patients to self-report symptoms during check-in so that providers reviewed their results during patient encounters (Siniscalchi et al., 2020). MBC could be administered to patients diagnosed with depression and helped with the scheduling follow-ups in four to six weeks (Siniscalchi et al., 2020). The implementation of VitalSign6 software in EHRs captured more patients with depression because EHR alerts prompted providers to review PHQ-9 scores and provided follow-up care.

Clinicians also benefited from a patient-reported outcome measure for monitoring primary care patients with depression (PROMDEP). PROMDEP was an intervention that allows providers to administer PHQs and then follow up within two and four weeks of diagnosis (Kendrick et al., 2017). The PROMDEP increased patient involvement in their care as practitioners interpret scores, patients receive scores, and treatment is recommended (Kendrick et al., 2017). Some practitioners found PROMDEP to be time-consuming and wanted more guidance on how to account for the results in patients' treatment as PROMDEP scores do not inform practitioners of best treatment choices such as psychopharmacology or psychotherapy.

Despite those challenges, Kendrick et al. (2017) encouraged more practitioners to utilize PROMDEP. The lack of follow-up led to more complications in patients who suffered from depression and obesity.

Gaps in the Literature

Several themes emerged during the literature review and revealed gaps in the literature. For example, screening for depression was not routinely performed in primary outpatient settings (Samples et al., 2019; Willliams et al., 2017). Most studies discussed that the screening for depression was based on signs and symptoms of depression, including low mood and energy, lack of sleep, poor appetite with either weight gain or loss, and sleeping too much or too little (Arhi et al., 2021; Etman et al., 2020; Jha et al., 2019; Shao & Zhu, 2020). Patients who are obese struggled with depression as research concluded there is a relationship between mental health and body weight (Zhang, 2021).

The USPSTF recommended screening adults aged 18 years and older for depression in primary care settings and utilizing evidence-based protocols to ensure depression is captured early (Siniscalchi et al., 2020). The sequenced treatment alternatives to relieve depression (STAR-*D) study supported regular depression screening (Siniscalchi et al., 2020). Despite these efforts, many individuals with depression remain undiagnosed. One reason was the lack of an alert system to notify providers to screen obese patients for depression (Jeffery et al., 2021; Siniscalchi et al., 2020). Depression remains unidentified and left untreated (Shao & Zhu, 2020; Zhang, 2021). As a result, some individuals may be unable to sustain or maintain employment, housing, or shelter (Shao & Zhu, 2020). People suffering from depression turned to alcohol or substance abuse, which led to incarceration, increasing the cost of healthcare dollars (Jha et al., 2019). Morbidities from obesity leading to cardiovascular events, diabetes, and gastrointestinal

and chronic pain increased the risk of hospitalizations and death-related attempts or commit suicide (Acosta et al., 2017). Thus, it was vital to evaluate the impact of standardized screening for depression in patients struggling with obesity, which was reinforced by EHR alerts.

Summary

The project variables included EHR alerts and depression screening in patients with a BMI of 30 or greater. The expectation was that the EHR alerts would improve providers' awareness of the need for depression screening and prompt them to screen for depression and obesity. The goal was to facilitate change and hopefully close the gaps in the standards of care. Chapter 2 discussed the theories used to guide studies and the literature related to the study design, sample and data collection tools, and statistical analysis. The chapter ended with an overview of major themes from the literature appraisal and identified some gaps in the literature. In Chapter 3, the study methodology was discussed.

Chapter 3 Method

Without the implementation of EHR alerts for depression screening, those patients who present with a BMI of 30 or greater may not be identified and subsequently go untreated for depression. The purpose of this study was to examine if integrating an EHR alert into patients' charts would increase the incidence of screening patients with a BMI of 30 or greater for depression for early identification and treatment. Chapter 3 included a detailed discussion of this project's design, sample, procedures, and data collection and analysis.

Design

After reviewing the literature, a quality improvement study with a retrospective and prospective design was identified as the best method for conducting this study. Quality improvement was based on systematic data-guided activities designed to improve healthcare delivery in particular settings (Melynk & Fineout-Overholt, 2023). These activities included methods designed to solve practical clinical problems and bring about and evaluate change based on evidence. Evidence-based and quality improvement approaches encouraged professionals in clinical settings to use their daily experience to identify promising ways to improve standards of care and implement small changes, collect data on the effects of changes, and assess results (Melynk & Fineout-Overholt,2023).

A prospective and retrospective study design looked at timing in relation to the outcome (Holly, 2019; Polit & Beck, 2021; Ranganathan & Aggarwal, 2018). In retrospective designs, the outcomes have already occurred as data were previously collected prior to implementation (Holly, 2019; Polit & Beck, 2021). In prospective designs, the outcomes have not yet occurred, and a variable was observed over a time period so that data are collected as the variable changes (Holly, 2019; Polit & Beck, 2021). In this project, the focus was on collecting data before and

after integrating an EHR alert into patients' charts to empower providers to screen those patients with a BMI of 30 or greater for depression for early identification and treatment.

Other methodologies were examined and excluded as they did not fit the purpose of this study. For example, cohort studies relied on strong scientific evidence on the hierarchy of research (Stillwell et al., 2010); however, this study examined the relationship of variables. In a case-control study, case-control groups were surveyed to determine the differences between groups and why one group had an outcome and the other did not (Polit & Beck, 2021). A case control starts with the outcome from the present to the past, which might have been a suitable design for this study. A retrospective study uses historical data from the past to the present, which was also a suitable design. Combining retrospective and prospective designs was the most appropriate strategy to examine if integrating an EHR alert to patients' charts would impact the incidence of depression screening among patients with a BMI of 30 or greater for early identification and treatment.

Sample

The target population for this project was patients with a BMI of 30 or greater. Anyone with a BMI of 29.9 or lower was not included in the study. The sample was recruited from an integrated primary care clinic in North Virginia. At the time of this study, the patient population seen at this practice totaled about 2,000 patients annually and about 160 patients per month. The clinic had one medical director, an office manager, two nurse practitioners, one medical assistant, and two therapists. The office was in a multi-commercial building with other business offices. The most common diagnoses seen were hypertension, hyperlipidemia, diabetes, depression, and obesity. The percentage of patients diagnosed with depression was 40%, and

those with obesity were 80%. In the clinic, primary insurance was accepted, as well as cash payments.

The following inclusion criteria were used to identify potential participants within the clinical setting: individuals between ages 18 to 99 years with a BMI of 30 or greater post-bariatric surgery and with medical conditions including depression. Patients were not discriminated against age, ethnicity, race, or insurance. Excluded participants were walk-ins, patients with cognitive disabilities (especially if they are not able to provide consent to participate in the study), participants who provided incomplete data on registration, and children and other vulnerable populations, such as pregnant or imprisoned patients, were not commonly seen in the practice. Those participants were excluded due to the risk of losing follow-up care (Patino & Ferriera, 2018).

Participants were screened at the integrated primary care clinic during routine nurse practitioner encounters. Retrospective PHQ-9 screening scores were retrieved to analyze if previous screenings for depression were completed and what percentage of those screens were completed for patients who presented with a BMI of 30 or greater. In the prospective arm of the study, EHR alerts were implemented to notify nurse practitioners to screen patients with a BMI of 30 or greater for depression using the PHQ-9. Data were collected to examine if the incidence of depression screening for patients with BMI of 30 or greater improved and if there was a relationship between the EHR alerts to screen for depression and depression identification and treatment.

Sample Size

Before the study, a power analysis was conducted to determine the minimum required sample size. The calculations were based on 160 patients per month with an estimated 80% of

the patients who were diagnosed with obesity, the available sample was about 384. Based on sample size calculations from Calculator.net, for a confidence interval of 95% and marginal error of 5%, 193 or more charts were needed for the retrospective and prospective arms to obtain the minimum sample. If a *p*-value is used to examine the error, the likelihood of a type I error is lowered (Shreffler & Huecker, 2023). To avoid type II errors, high statistical power is needed; thus, the *p*-value for this study was set to 0.5 or less. The higher the statistical power, the higher the chance of avoiding errors (Shreffler & Huecker, 2023).

Protection of Human Subjects

The Institutional Review Board (IRB) is a federally mandated committee to protect human subjects and is based on three types of studies (National Institute of Health [NIH], n.d.). Exempt research was considered when the risk from research activities is low or studies do not need to meet the criteria for review or approval, such as standard educational settings, collecting new data, and surveys without direct patient interaction (U.S Department of Health and Human Services [USDHH], n.d.). An expedited study may be approved when there is minimal risk [USDHH, n.d.). Full board reviews were required for studies with vulnerable populations, including children, prisoners, those with cognitive disabilities, and high risk for potential harm, emotional distress, and educational distress (Centers for Drug Evaluation and Research 2019). This study did not include vulnerable populations or intervention procedures that would increase the risk of harm. Therefore, the IRB approved this study as an exempt research study.

The following information was retrieved from the patients' charts: age, gender, ethnicity, BMI, income, insurance, diagnosis of depression, PHQ-2 and PHQ-9 scores, and depression treatment (pharmacologic and non-pharmacologic). All participants were treated equally with respect and participated voluntarily. When conducting clinical research, obtaining informed

consent is required. Informed consent was a procedure by which a competent participant voiced their willingness to participate in a clinical trial after receiving and understanding all their research-related information (Manti & Lacari, 2018). Patient privacy and confidentiality were also included on the consent form. Study participants were provided with an information sheet with the study's purpose, risks, and benefits. Participants were also informed that the research study included no deception. Participants received full disclosure and were provided with informed consent with explanations of what the study involved. Participants were allowed sufficient time to discuss the informed consent process and voluntarily agree to participate in the study. The only research aspect in this study was the integration of the EHR alerts based on evidence-based practice recommendations for early identification and treatment of depression and observing if the incidence of depression screening changed. The treatment for depression was not part of the study. The treatment was based on clinical standards of care for those participants diagnosed with depression. A direct benefit of participation in this study was early identification and treatment of depression due to implementing EHR alerts.

Most risks were detailed on the consent form, which all participants were asked to sign before engaging in the study. A risk in any research study is related to a breach of confidentiality. In this study, the participants' information was protected. Since the study was based on chart reviews, a request for a waiver for informed consent was submitted to the Radford University IRB. The consent was the only document linking the participants to the study as this study primarily engaged in secondary data analysis. However, to prevent a breach of confidentiality, all data were kept in encrypted files and locked in file cabinets at the project site. Health Insurance Portability and Accountability Act (HIPAA) regulations were followed for data collection and storage. To prevent a breach of confidentiality, the clinical manager pulled

unidentifiable data from patient's charts and provided it to the DNP student. After three years, paper documents will be shredded, and electronic documents will be deleted.

Procedures

The study followed a retrospective-prospective design to determine if using EHR alerts to prompt depression screening for patients with a BMI of 30 or greater impacted depression identification and treatment. The study began after approval from Radford University's IRB. The retrospective chart review was conducted between February 2024 to April 2024. The prospective arm of the study included de-identified patient data collected between May 2024 to July 2024 using the Raw Data Intake Form (RDIF). An EHR alert was created and added to the EHR system during the prospective phase. The EHR alert was attached to a patient's name, and when the provider opened the chart, a notification popped up, prompting providers to screen the patient for depression with the PHQ-9. Data were extracted from the patient charts with the key search related to demographics, including age, gender, ethnicity, 30, income, insurance, diagnosis of depression, PHQ-2 and PHQ-9 scores, and treatment (pharmacologic and non-pharmacologic). The exact process was repeated for the prospective arm by adding an EHR alert as an item to retrieve data.

Data Collection Instrument

An original RIDF was created to collect data. The RIDF included age, gender, ethnicity, BMI, income, insurance, diagnosis of depression, PHQ-2 and PHQ-9 scores, and treatment (pharmacologic and non-pharmacologic). Early identification of depression was measured using the PHQ-9. The PHQ-9 was first developed by Spitzer and Kroneke in 1999. The purpose of the PHQ-9 was to diagnose and measure the severity of depression. The screening tool consists of nine questions. Each question is measured on a scale of 0 = not at all, 1 = several days, 2 = more

than half the days, and 3 = nearly every day (Kroneke et al., 2001). The level of measurement is a ratio. A score ranging from 0 to 4 indicates minimal or no depression. A score ranging from 5 to 9 was mild depression, and moderate depression was indicated by a score ranging from 10 to 14. A score ranging from 15 to 19 indicated moderate to severe depression, and a score of 20 to 27 indicates severe depression.

The PHQ-9 is a universal screening tool in outpatient clinical settings and has been validated to assess the severity of depression (Kroenke et al., 2001). Research studies have consistently shown that PHQ-9 was a reliable and valid screening tool for assessing severe depression (Sun et al., 2020). In one research study, Pearson correlation analysis was used to correlate each item score of PHQ-9 with the total score (Sun et al., 2020). The correlation coefficient ranged from 0.567 to 0.789 ($p < 0.01$), which shows good reliability (Sun et al., 2020).

The PHQ-9 also showed good validity and high adaptability with presenting symptoms of depression in patients with major depressive disorder (Sun et al., 2020). A study examined the variability of presenting symptoms of depression for those individuals with a BMI of 30 or greater who were screened for depressive symptoms and severity using the PHQ-9 (Malpass et al., 2016). The validity and reliability of PHQ-9 were also assessed in a study conducted primarily in Botswana (Molebatsi et al., 2020). The authors concluded that to improve the health outcomes of patients in primary care, mental health screening, such as for depression, should be integrated into routine healthcare visits. The research study demonstrated the importance of integrating routine depression screening using the PHQ-9 into primary care settings (Molebasti et al., 2020). However, there was a substantial need for better implementation of measurement-based care guidelines and consistent documentation of follow-up screening in EHR (Rezaeizadeh

et al.,2021). This DNP project aimed to improve the incidence of early identification and treatment of patients with a BMI of 30 or greater after implementing an EHR alert to remind providers to screen patients with the PHQ-9.

Data Protection and Management

The subjects' data were kept confidential by utilizing encryption when data were retrieved electronically. The practice manager generated a de-identified report that was entered and stored on the clinic's EHR with password protection to maintain patient safety and confidentiality. The practice manager monitored access at every patient encounter. Additional oversight was not needed. The study included minimal risk. However, there was always a risk of breach of confidentiality. Therefore, patients' charts were coded with assigned numbers instead of patient identifying information. Data were kept on password-protected computers in a locked office and under 24-hour surveillance. In the event of detected harm, Radford University IRB would have been promptly notified to protect the subjects from avoidable harm.

Data Analysis

The Statistical Package for the Social Science (SPSS) software could be utilized for data analysis. SPSS assists in calculating statistics (Kim et al., 2022). To conduct hypothesis testing, data must be free of errors. Data cleaning of missing data can be a severe problem in data analysis (Kim et al., 2022). The dependent variable was early identification and treatment of depression, and the independent variable was the EHR alert for patients with a BMI of 30 or greater. Descriptive and inferential statistics were performed to analyze the collected data. Descriptive statistics were used to evaluate demographics and analyze variables. For example, comparison of male to female patient populations. In addition, the mean age of the sample was identified. The means were generally distributed by examining scores using graphs or plots. The

homogeneity of variance and variability in each group needed to be approximately equal.

Inferential statistics included Pearson's correlation coefficient that examined the relationship between the incidence of depression screening in the retrospective and prospective periods and whether the patients were identified and treated for depression. Pearson's *r* is the most common statistical test used for interval and ratio levels of measurement and is a parametric test with a set of assumptions, included distributional assumptions, such as normality (Kim et al., 2022). Pearson's correlation ranges from -1 to + 1 where -1 indicates a negative correlation and + 1 is a positive correlation. A score of 0 to 0.425 indicates a weak positive correlation, a score between 0.4 and 0.8 indicates a moderate positive correlation, and a score of greater than 0.8 indicates a strong positive correlation (Polit & Beck, 2021). To assess if the correlation was statistically significant, the *p*-value was set at 0.05. The null hypothesis was rejected if the *p*-value was less than .05, and it was concluded that the EHR alerts led to increased screening for early identification and treatment of depression.

Missing data would have affected the generalizability of the results. The most straightforward approach was to delete cases with missing data and run the data analysis with completed cases (Kim et al., 2022). The following approach was an estimation, which might have introduced bias with analysis. However, when a sample size is too small, the deletion of missing data would create further problems (Kim et al., 2022). Outliers were unexpected values outside of the expected range, which can also be a serious problem threatening the internal and external validity of the study (Kim et al., 2022). In this study, data were carefully examined before including the information was included in the statistical analysis. Table 1 described the characteristics of the variables.

Table 1

Characteristics of Variables

Variables	Questions from Instrument	Item Score	LOM	Statistical test
Age	18 -28 29-38 39-48 49-55	1=selected,0=not selected	ratio	Percentages
Gender	Female and Male	1=selected, 0=not selected	nominal	percentages
Ethnicity	African American, White, Spanish, Asian, non-white	1= selected, 0=not selected	nominal	Percentages
Marital status	Single, married, divorced, partnership	1=selected, 0=not selected	nominal	Percentages
BMI	BMI>30	1=selected, 0=not selected	interval	Pearsons correlation
Income	10k-15k 15k-30k 30k-50k 50k-60k 60k-70k 70k-90k 90 or higher	1=selected, 0=not selected	ratio	Mean
Depression, mild, moderate, severe	PHQ-9	1=0, 0=not selected	ratio	Pearson correlation

Note. All participant's demographics were included in the study.

Summary

Many patients with a BMI of 30 or greater experience undiagnosed depression due to a lack of screening in primary care settings. The purpose of this study was to examine the relationship between integrating an EHR alert into patients' charts and the incidence of screening patients with a BMI of 30 or greater for depression for early identification and treatment. Chapter 3 provided details on the study's design, sample, procedures, data collection, and data analysis. Protecting human subjects included ensuring patient safety by following IRB guidelines (Manti

& Lacari, 2018). SPSS is a data analysis software which was utilized to organize and analyze study variables. Chapter 4 discussed the study's results.

Chapter 4: Results

The purpose of this study was to examine if integrating an Electronic Health Record (EHR) alert into patient charts increased the incidence of screening patients with a BMI of 30 or greater for early identification and treatment of depression. This chapter presented the project results, including a description of the participant's characteristics and demographics. A chart review was conducted to test the study hypothesis. A complete analysis was conducted for both retrospective and prospective arms. The analysis calculated descriptive and inferential statistics, conducted a correlation analysis, and computed additional statistical measures. Intellectus statistics was used for data analysis. Intellectus is a statistical software platform that assists with statistical analyses and interpretation of data. The tool is approved by Radford University to assist students with statistical analysis.

Description of the Sample

In this study, patient demographics were collected and organized using a Raw Data Intake Form (RDIF) and later transferred to Intellectus. The demographic variables included a BMI of 30 or greater, ages from 18 to 99, genders both male and female, ethnicity to include African American, Asian, Spanish, White and Non-White, marital status: single, married, divorced, partnership, and income ranging from 10k to 15k, 15k to 30k, 30k to 50k,50k to 60k, 60k to 70k, 70k to 90k and 90k and higher. The demographic data from the retrospective and prospective arms were separately discussed, and the characteristics of the participants and their influence on the findings were compared. See Table 1.

Analysis of Research Question and Hypothesis

This study poses the following clinical question and tests the following hypothesis: In patients with a BMI of 30 or greater, how does an EHR alert to screen for depression during a

primary care visit affect early identification and treatment of depression? The following hypothesis was tested, and a correlation was made in comparison of the retrospective and prospective arms, an alternative hypothesis included H1: An EHR alert to screen patients with a BMI of 30 or greater for depression during a primary care visit affects early identification and treatment of depression. The Null Hypothesis H0 stated: An EHR alert to screen for patients with a BMI of 30 or greater for depression during primary care visit does not affect early identification and treatment of depression. To test the hypothesis, a quality improvement study was conducted with retrospective and prospective arms. In the section below the results from the study were detailed.

Retrospective Arm

In this retrospective arm, a chart review was conducted on de-identified patient data from February 2024 to April 2024. A hundred charts were reviewed related to patient demographics, including age ranges from 18 to 28, 29 to 38, 39 to 48, 49 to 55, and 55+, genders both male and female, ethnicity of African American, Asian, Spanish, White and Non-White, marital status single, married, widowed, divorced or partnership, and income ranging from 10k to 90k and above. Charts were also selected based on the criteria of a BMI of 30 or greater. The final sample was 33 charts that met the study's inclusion criteria. Table 2 provided a detailed description of retrospective arm’s frequencies and percentages of the descriptive results.

Table 2

Retrospective Arm Frequency and Percentage Table for Nominal Variables

Variable	*n/N*	*%*
Gender		
Female	30	90.91
Male	2	6.06
Other	1	3.03
Age		
18-28	5	15.15
29-38	11	33.33
39-48	6	18.18
49-55	6	18.18
55+	5	15.15
Marital Status		
Single	11	33.33
Married	9	27.27
Partnership	5	15.15
No response	8	24.24
Income		
No income provided in charts	33	100.00
PHQ-2		
No	0/33	0
PHQ-9_administered		
Yes	7/33	21.21
No	26/33	78.79
counseling	0	0
Medication		
Duloxetine	1/33	3.03
Lamotrigine	2/33	6.06
Escitalopram	3/33	9.09
Venlafaxine	2/33	6.06
Sertraline	1/33	3.03
No medication	24	72.73

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

Retrospective Arm Descriptive Statistics

Frequencies and percentages. Frequencies and percentages were calculated for gender, age, marital status, income, PHQ-2, PHQ-9, counseling, and medication. The sample size for the retrospective size was 33 de-identified charts. The most frequently observed category of gender was female (*n* =30, 90.91%). The most frequently observed category of age was 29 to 38 (*n* = 11, 33.33%). The most frequently observed category of marital status was single (*n* =11, 33.33%). The most frequently observed category of income was "no" income (*n* =33, 0%). Of the 33 charts, zero to none included screening with the PHQ-2 tool. Of the 33 charts, only seven charts included screening with a PHQ-9 (21.21%). Counseling was not offered to any of the subjects in the retrospective arm. Regarding medications, only nine of the subjects were prescribed treatment. Most of the patients with a BMI of 30 or greater who were screened either in the retrospective arm of the study had none to a minimum or mild scores of depressions. Those scores indicating none-to-minimal depression were 15.15%. For the mild depression, it was noted to be at 0.6%. None of the 7 out of 33 subjects from the screened charts had moderate or severe depression. See Table 3.

Table 3c

PHQ-9 Scores

Item	n/N	%
None-minimum 0-4	5/33	15.15%
Mild 5-9	2/33	0.06%
Moderate 10-14	0/33	0%
Severe 20-27	0/33	0%

Retrospective Arm Inferential Statistics

Pearsons Correlation. A Pearson correlation requires that the relationship between each pair of variables is linear (Conover & Iman, 1981). This assumption is violated if there is

curvature among the points on the scatterplot between any pair of variables. Figure 1 presented the scatterplot of the correlation. A regression line has been added to assist the interpretation. The result of the correlation was examined based on an alpha value of .05. There were no significant correlations between any pairs of variables. See Table 3 and Figure 1 for the correlational analysis results.

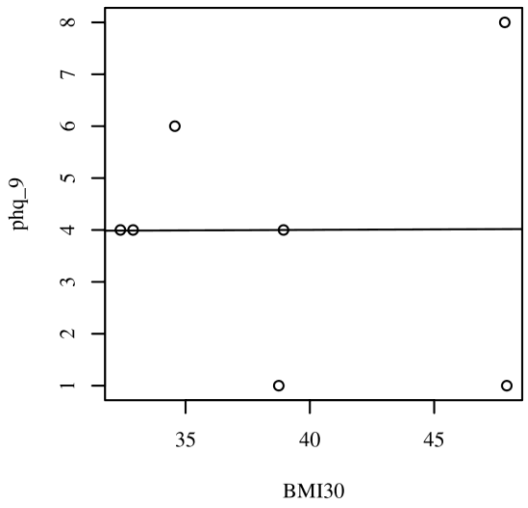
Table 4

Pearson Correlation Results Between BMI30 and PHQ-9

Combination	*r*	95.00% CI	*n*	*p*
BMI30-PHQ-9	.00	[-.75, .76]	7	.992

Figure 1

Scatterplots with the Regression Line Added for BMI 30 and PHQ-9



Two-tailed independent samples t-test. A two-tailed independent samples *t*-test was conducted to examine whether the mean BMI of 30 or greater was significantly different between the Yes (those screened) and No (those who are not screened) categories of PHQ-9 administered.

Normality. Shapiro-Wilk tests were conducted to determine whether a BMI of 30 could have been produced by a normal distribution for each category of PHQ-9 administered (Razali & Wah, 2011). The result of the Shapiro-Wilk test for a BMI of 30 or greater in the Yes category was not significant based on an alpha value of .05, $W = 0.85$, $p = .125$. This result suggested that a normal distribution should be ruled out as the underlying distribution for a BMI of 30 or greater in the Yes category. The result of the Shapiro-Wilk test for a BMI of 30 or greater in the No category was significant based on an alpha value of .05, $W = 0.91$, $p = .025$. This result suggested that a BMI of 30 or greater in the No category is unlikely to have been produced by a normal distribution. The Shapiro-Wilk test was significant for the No category of PHQ-9 administered, indicating the normality assumption is violated. See Table 5 and Figure 2.

Table 5

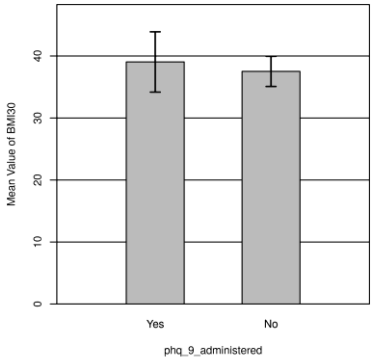
Two-Tailed Independent Samples t-Test for BMI30 between screened or no with PHQ-9

	Yes			No					
Variable	*M*	*SD*	*n*	*M*	*SD*	*n*	*t*	*p*	*d*
BMI30	39.04	6.56	7	37.52	6.32	26	0.56	.579	0.24

Note. N = 33. Degrees of Freedom for the *t*-statistic = 31. *d* represents Cohen's *d*.

Figure 2

The mean of BMI30 by levels of PHQ-9 administered with 95.00% CI Error Bars



Two-tailed Mann-Whitney U-test. A two-tailed Mann-Whitney two-sample rank-sum test was conducted to examine whether there were significant differences in BMI of 30 or greater between the levels of PHQ-9 administered. The two-tailed Mann-Whitney two-sample rank-sum test is an alternative to the independent samples *t*-test but does not share the same assumptions (Conover & Iman, 1981). There were seven observations in group Yes and 26 observations in group No. The result of the two-tailed Mann-Whitney *U* test was not significant based on an alpha value of .05, $U = 111$, $z = -0.88$, $p = .378$. The mean rank for group Yes was 19.86 and the mean rank for group No was 16.23. This suggested that the distribution of a BMI of 30 or greater for group Yes (Mdn = 38.75) was not significantly different from the distribution of a BMI of 30 or greater for the No (*Mdn* = 36.53) category. Table 6 presented the result of the two-tailed Mann-Whitney *U* test. See Table 5 for details. Figure 3 presented a boxplot of the ranks of BMI of 30 or greater by PHQ-9 administered.

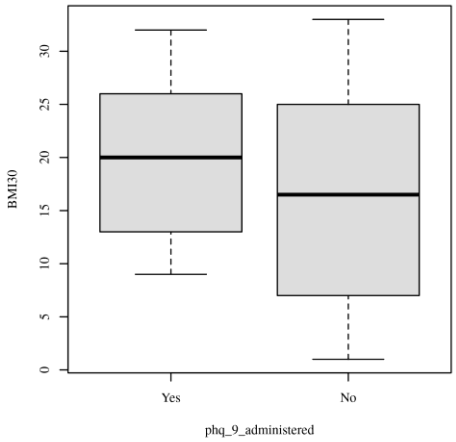
Table 6

Two-Tailed Mann-Whitney Test for BMI30 by PHQ-9 administered

	Yes		No				
Variable	Mean Rank	*n*	Mean Rank	*n*	*U*	*z*	*p*
BMI30	19.86	7	16.23	26	111.00	-0.88	.378

Figure 3

Ranks of BMI30 by PHQ-9 administered



Prospective Arm

In the prospective arm, a chart review of de-identified patient data was conducted after implementing electronic health records (EHR). A hundred charts were reviewed from May 2024 to August 2024. Data collection was based on the following inclusion criteria: a BMI of 30 or greater, demographics such as age from 18 to 28, 29 to 38, 39 to 48, 49 to 55, and 55+, gender both male and female, ethnicity to include African American, Asian, Spanish, White, and Non-White , marital status was single, married, widowed, divorced or partnership, income ranged from 10k-15k,15k to 30k, 30k to 50k, 50k to 60k, 60k to 70k, 70k to 90k, 90 or higher. The final sample included 30 charts with a BMI of 30 or greater who met the study inclusion criteria. Table 7 provided a detailed description of the prospective arm's frequencies and percentages of the descriptive results.

Table 7

Prospective Arm Frequency Table for Nominal Variables

Variable	*n/N*	*%*
Gender		
Female	27/30	90.00
Male	3/30	10.00
Age		
18-28	5/30	17.24
29-38	5/30	17.24
39-48	6/30	20.69
49-55	4/30	13.79
55+	9/30	31.03
Marital Status		
Single	29/30	96.67
Partner	1/30	3.33
Medication		
Duloxetine	2/30	6.67
Escitalopram	3/30	10.00
Bupropion	1/30	3.33
Venlafaxine	1/30	3.33
No medication	23/30	76.67
PHQ9 Administered		
Yes	16/30	53.33
No	14/30	46.67

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

Prospective Arm Descriptive Statistics

Frequencies and percentages. Frequencies and percentages were calculated for gender, age, marital status, income, PHQ-2, PHQ-9, counseling, and medication. The sample size that met the study inclusion criteria for the prospective arm was 30 de-identified charts. From the demographics, the most frequently observed category of gender was female (n = 27, 90.00%). The most frequently observed category of age was 55+ (n = 9, 31.03%). The most frequently

observed category of marital status was single (*n* = 29, 96.67%). The most frequently observed category of medication was "No" for medication (*n* = 23, 76.67%). The most frequently observed category of administered PHQ-9 was "Yes" (*n* = 16, 53.33%).

The prospective arm PHQ-9 scored ranged from no-to-minimum depression (33.33%), mild (13.33%), moderate (06.66%). None of the screened with PHQ-9 subjects received counseling along with psychopharmacology. See Table 8 for details.

Table 8

PHQ-9 Scores from Prospective Arm

Item	n/N	%
None-minimum 0-4	10/30	33.33%
Mild 5-9	4/30	13.33%
Moderate 10-14	2/30	.06.66%
Severe 20-27	0/30	0%

Prospective Arm Inferential Statistics

Pearsons Correlation analysis. A Pearson correlation analysis was conducted between PHQ9 and a BMI of 30 or greater. Cohen's standard was used to evaluate the strength of the relationship, where coefficients between 0.10 and 0.29 represent a small effect size, coefficients between 0.30 and 0.49 represent a moderate effect size, and coefficients above 0.50 indicate a large effect size (Cohen, 1988). A Pearson correlation requires that the relationship between each pair of variables is linear (Conover & Iman, 1981). This assumption is violated if there is curvature among the points on the scatterplot between any pair of variables. Figure 1 presented the scatterplot of the correlation. A regression line has been added to assist the interpretation.

The result of the correlation was examined based on an alpha value of 0.05. A significant positive correlation was observed between PHQ9 and BMI of 30 or greater, with a correlation of 0.50, indicating a large effect size ($p = 0.047$, 95.00% CI = [0.01, 0.80]). This analysis suggested

that as PHQ-9 screening increases, identifying those patients with BMI of 30 or greater tends to be increased. Table 9 presented the correlation analysis results of the prospective arm. Figure 4 represented the scatterplots with the regression line added for PHQ-9 and BMI of 30 or greater.

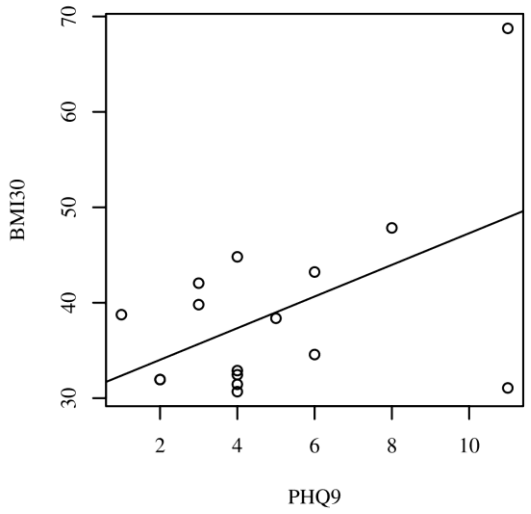
Table 9

Prospective Arm Pearson Correlation Results Between Screening with PHQ-9 and Identifying Those with BMI of 30

Combination	*r*	95.00% CI	*n*	*p*
PHQ9-BMI30	.50	[.01, .80]	16	.047

Figure 4

Scatterplots with the Regression Line Added for PHQ9 and BMI 30



Two-tailed independent sample t-test. A two-tailed independent samples *t*-test was conducted to examine whether the mean of BMI of 30 or greater was significantly different between the Yes (screened) and No (not screened) categories of PHQ-9 Administered.

Normality. Shapiro-Wilk tests were conducted to determine whether a BMI of 30 or greater could have been produced by a normal distribution for each category of the administered

PHQ-9 (Razali & Wah, 2011). The result of the Shapiro-Wilk test for a BMI of 30 or greater in the "Yes" category was significant based on an alpha value of 0.05, $W = 0.77$, $p = 0.001$. This result suggested that a BMI of 30 or greater in the "Yes" category was unlikely to have been produced by a normal distribution. The result of the Shapiro-Wilk test for a BMI of 30 or greater in the "No" category was significant based on an alpha value of 0.05, $W = 0.78$, $p = 0.003$. This result suggested that a BMI of 30 or greater in the "No" category was unlikely to have been produced by a normal distribution. The Shapiro-Wilk test was significant for both the "Yes" and "No" categories of the administered PHQ-9, indicating the normality assumption is violated for this parametric statistical test.

Homogeneity of variance. Levene's test was conducted to assess whether the variance of BMI of 30 or greater was equal between the categories of the administered PHQ9. The result of Levene's test for a BMI of 30 or greater was not significant based on an alpha value of 0.05, F (1, 28) = 0.35, $p = 0.558$. This result suggested it was possible that the variance of BMI of 30 or greater was equal for each category of the administered PHQ-9, indicating the assumption of homogeneity of variance was met.

Analysis of Results

Chapter 4 analyzed the effect of initiating an EHR alert into patients' charts to identify those with a BMI of 30 or greater and to screen them for depression. The question asked in this study was: In patients with a BMI of 30 or greater, how does an EHR alert to screen for depression during a primary care visit affect early identification and treatment of depression? The following hypothesis was tested, and a correlation was made between the retrospective and prospective arms:

H1: An EHR alert to screen patients with a BMI of 30 or greater for depression during a primary care visit affects early identification and treatment of depression.

H0: An EHR alert to screen for patients with a BMI of 30 or greater for depression during primary care visit does not affect early identification and treatment of depression.

From the retrospective data analysis, seven out of 33 (21.21%) subjects with a BMI of 30 or greater were screened with PHQ-9. From the prospective data analysis, 16 out of 30 (53.33%) charts included screening with PHQ-9. In comparison between the retrospective (21.21%) and prospective arm (53.33%), more patients with a BMI of 30 or greater were screened with PHQ-9 after integrating an EHR alert in patients' charts, which was double the number of patients screened and identified with depression. Based on the inferential statistics and correlation analysis of the prospective arm, it was concluded that screening with PHQ-9 increased after implementing the EHR alert, indicated by a moderate correlation of 0.50 and a significant p-value of 0.047. This analysis suggested that as PHQ9 screening increases, identifying those patients with a BMI of 30 or greater tended to increase as well. Based on the correlation analysis of the prospective arm, the null hypothesis was rejected, and the alternate hypothesis was retained, concluding that an EHR alert to screen patients with a BMI of 30 or greater for depression during a primary care visit affects early identification and treatment of depression.

Summary

Chapter 4 detailed the results of this study and organized the content under the statistical analysis for the retrospective and prospective arms. Based on the inferential statistics, specifically on Pearson's correlation, it was concluded that the implementation of the EHR alert increased the screening of patients with a BMI of 30 or greater for depression in the perspective arm. The Pearson correlation between the variables of PHQ-9 and BMI was 0.50, with a p-value

of .047, indicating moderate correlation with statistical significance. Thus, the null hypothesis was rejected, and the alternative hypothesis was retained. Based on the results of this study, it was concluded that an EHR alert to screen patients with a BMI of 30 or greater for depression during a primary care visit affects early identification and treatment of depression.

Chapter 5: Conclusions and Recommendations

Chapter 5 summarized the conclusions of the research project. This section connected the findings to prior research publications. In addition, this chapter included implications for nursing practice, interpretations of the study and recommendations for future research.

Relationship Between Project Findings and Prior Research

The purpose of this study was to examine the effect of integrating an Electronic Health Record (EHR) alert into patients' charts on the incidences of screening patients with a BMI of 30 or greater for early identification and treatment of depression. This project addressed the following clinical question: In patients with a BMI of 30 or greater, how does an EHR alert to screen for depression during a primary care visit affect early identification and treatment of depression? As a result of this study, it was concluded that integrating EHR alerts into patient's charts improved screening for depression by 53.33%. During the review of the literature, a close relationship between obesity and depression was identified (Rutheford et., 2022). Furthermore, it was noted that adding an EHR alert to a patient's chart helped providers identify patients with a BMI of 30 or greater for depression by utilizing the PHQ-9 screening tool (Jeffery et al., 2021; Larson et al., 2022; Siniscalchi et al., 2020). Thus, this study further added to the literature evidence that by integrating an EHR alert to a patient's chart, providers increased the frequencies of screening those patients with a BMI of 30 or greater for depression.

In this research, 27 articles from the literature were reviewed. Despite obesity and depression often coexisting, as noted during the review of the literature, healthcare providers do not routinely screen for them, and many patients may go undiagnosed with depression and are left untreated (Blackstone et al., 2022; Garcia et al., 2022; Pfoh et al., 2020). Therefore, this project implemented an EHR alert into patients' charts to increase the incidence of screening

depression for those patients with a BMI of 30 or greater. The EHR alert was implemented based on the literature review findings. This study also concluded that providers increased screening for depression with the implementation of EHR electronic alerts. The literature review also found a correlation between a BMI of 30 or greater and depression and that PHQ-9 was the gold standard used to identify those with depression.

During the literature review, it was noted that a good sample size was between 1,000 and 4,500 subjects. The literature review found a few studies with small sample sizes. The study supported the research with a small sample size based on the short period for data collection, which was three months (Bosc et al.,2022; Behrens et al., 2020; Kendrick et al.,2017; Malpass et al., 2016; Pasi et al., 2023; Maximiano et al., 2021). Also, a chart review was conducted at only one clinical site. However, there were similarities between the research studies and this project because the research was conducted in outpatient primary clinical settings (Cumbe et al., 2020; Kendrick et al., 2017; Malpass et al., 2016; Siniscalchi et al., 2020). Despite the small sample size, this study concluded with statistical significance. Thus, in the prospective arm, by adding an alert to a patient's chart improved the frequencies of screening for depression those adults with a BMI of 30 or greater. Based on the descriptive analysis of this study, the screening from the retrospective arm was 21.21%, which was congruent with the low screening rates noted in previously published research. In this study, after integrating the EHR alert in the prospective arm, screening increased to 53.33%, which was statistically significant compared to the retrospective arm and further supported the evidence from the research.

Unexpected Findings

Some of the unexpected findings in the study were related to the results received on the PHQ-9 scores. An interesting finding was that most patients with BMI of 30 or greater who were

screened either in the retrospective or prospective arm of the study had none to a minimum, or mild scores of depression. With the retrospective arm, there was a low screening frequency of 21.21%, which meant 79% of those patients with a BMI of 30 or greater were not screened for depression in primary care. Those scores indicating none-to-minimum depression were 15.15%, and mild depression was identified at 0.6%. In the retrospective arm, more females between the age of 38 and 49 experienced none-to-mild depression.

The prospective arm was again represented by mostly females who had no-to-minimum depression (33.33%), mild (13.33%%), and moderate (06.66%). One explanation for the low PHQ-9 scores could have been that those patients who were screened for depression had already been treated with antidepressants. However, it was interesting to find that none of these patients have had any counseling along with psychopharmacology.

Challenges with Study Execution

During this research project, several challenges were experienced. A meeting was held with the practice manager and technology (tech) support from Office Ally on May 14th, 2024, to create the EHR alerts because the office was closed from May 15th to May 20th. The Chair and Institutional Review Board (IRB) compliance officer were informed of that change related to the start date. The IRB compliance officer confirmed that no changes to the protocol were necessary since the EHR setup occurred post-approval.

Another issue was related to the placement of the alert in the EHR. The tech support explained that providers could view EHR alerts by selecting the clinical decisions button in the objective section of the EHR. Tech support also mentioned that alerts were integrated into the notes without any pop-up notification for depression screening. To add new alerts with specific messages for screening patients with a BMI 30 or greater, the practice manager (who had the

authority to create the EHR alert) navigated through tabs and dropdown menus in the Office Ally EHR system and accessed the patients' charts. The practice manager communicated with the healthcare providers that the EHR alert was embedded in the patient's note. This notification was made to ensure that the providers were informed about the alert and could use it for screening purposes. IRB was also notified about the changes to the pop-up alert; again, no changes or amendments to the IRB protocol were requested. On November 19th, the IRB was contacted to extend 200 charts for review to obtain patient data and approval was granted.

Evaluation of Theoretical Framework

The health belief model was utilized to help guide the study. This quality improvement project had a two-arm retrospective and prospective study design. The sample of the study included subjects aged 18 to 99 with a BMI of 30 or greater. A chart review of de-identified patients was conducted over three months for both retrospective and prospective studies. A waiver of informed consent was approved by IRB.

The healthcare belief model was appropriate for addressing the clinical question and the variables of this project. The model consisted of six assumptions: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy. This study's findings significantly contributed to the theoretical framework of the health belief model and provided compelling evidence of the relevance of its six assumptions to the study purpose. One of the assumptions was related to perceived susceptibility and severity that a BMI of 30 or greater increased the risk for depression and the severity of developing depression. In this study's prospective and retrospective arms, subjects rating for depression on the PHQ-9 score ranged from non-minimum to moderate depression.

As noted in this study for the perceived benefits assumption, the benefits of adding or integrating an EHR alert into patients' charts also allowed providers to improve adherence to standards of care by screening patients with a BMI of 30 or greater for early identification and treatment of depression. Integrating EHR alerts in patients' charts helped providers reach out to patients who may be reluctant to talk about their symptoms for fear of being diagnosed with depression and the embarrassment of being labeled. Thus, a delay in diagnosis and treatment was minimized. The EHR alert served as a cue to providers and improved the incidence of screening for depression with 53.33% for those with a BMI of 30 or greater. Providers gained a sense of empowerment and self-efficacy when following standards of care based on clinical reminders such as EHR alerts to screen for conditions of depression.

Limitations

Time and technical difficulties impacted the start of the project. The timeline was modified to set up EHR alerts for patients' charts after receipt of IRB approval on May 9, 2024. The Raw Data Intake Form (RDIF) was used as an original instrument to collect data and then it had to be converted to adapt to the intellectual statistical requirements. No adaptation of a validated instrument was used as the PHQ-9 was not part of the project, but it was used as a tool to indicate the incidents of screening.

Regarding the sample characteristics, most of the participants were female in both the retrospective and prospective arms, where males were only 2% in the retrospective and 10% in the prospective arms. For social disparity, the study participants did not address race or income, and conclusions could not be drawn about those items. However, it was noted in the retrospective arm that more younger adults between the ages of 29 to 38 had depression and anxiety. In the prospective arm, a generational gap was noted where more older adults 55 and

older seemed to experience increased incidence of depression. Despite the small sample size, a statistical significance with a $p = 0.470$ was noted, and it was concluded that the incidents for screening improved after integrating an EHR alert in a patient chart during a primary care visit. There was a limited period of three months to gather data in both the retrospective and prospective arms; however, if six months or more had been allotted, the sample size could have been larger, and more patients could have been screened. Despite the short period of three months, in the prospective arm it was noted that adding the EHR alert improved the screening incidents. Thus, the study results were generalizable to primary care settings where providers see patients with a BMI of 30 or greater, applicable locally and globally.

Key Findings and Conclusions

Several interesting findings and conclusions were noted during this study. In the retrospective arm, 100 de-identified patient charts were reviewed, but only 33 charts met the study inclusion criteria. The most frequent category of age was those between the ages of 29 to 38 ($n = 11$, 33.33%). The most frequent category was single ($n = 11$, 33.33%). No income was provided for any of the 33 reviewed charts, and PHQ-2 screening was also not provided. However, it was noted among those 33 charts that only seven of them included screening patients with a BMI of 30 or greater for depression with the PHQ-9. Counseling was not offered, and only 9 of the 33 patients were prescribed antidepressant medications for treatment.

In the prospective arm, again 100 de-identified charts were reviewed. From those, there are only 30 charts that met the inclusion criteria and are included in the data analysis. The most common gender among the prospective as in the retrospective arm was female ($n = 9$, 27%), age was 55+($n = 9$, 31.03%), marital status was single ($n = 29$, 96.67%). No income was declared in the chart review ($n = 30$, 0%), no counseling was offered ($n = 30$, 0%), but medications for

depression were prescribed (*n* = 23,76.67%). However, the frequency of PHQ-9 screenings has significantly increased (*n* = 16, 53.33%). After the implementation of the EHR alert for those with a BMI of 30 or greater, PHQ-9 screenings for depression in the prospective arm n=16 have significantly improved, with 53.33% in comparison to the retrospective arm of n=7 with 21.21%.

A Pearson correlation was conducted between the variables of a BMI of 30 or greater and PHQ-9. The result of the correlation was examined based on an alpha value of .05. A significant positive correlation was observed between the variables of PHQ-9 and BMI of 30 or greater, with a correlation of p = .047, 95.00% CI = [.01, .80]. This analysis suggested that as PHQ-9 screening increased, identifying those patients with a BMI of 30 or greater tends to increase.

Analyzing the findings from both the retrospective and prospective arms highlighted the importance of integrating an EHR alert to screen those patients with a BMI of 30 or greater for depression. The prospective arm showed a significant improvement in PHQ-9 screenings (n=16,53.33%) in patients with a BMI of 30 or greater with a correlation of 0.50 and a p-value of .047, showing significance. Compared to the retrospective arm PHQ-9 screenings (n=7, 21.21%) with a p-value of 0.992 was not statistically significant. The implementation of an EHR in patient charts increased PHQ-9 screening to help identify those patients with a BMI of 30 or greater and with depression.

Implications

This study has important implications. The key findings of the results in the retrospective arm showed that only seven out of 33 (21.21%) charts were screened for depression. However, in the prospective arm, after the integration of EHR alert in patients' charts, there was an increase in PHQ-9 screenings where 16 out of 30 charts (53.33%) were screened with a PHQ-9, leading to a moderate correlation of 0.50 and a p-value of 0.47, which indicated statistical significance.

Based on the comparison of the results between the retrospective and prospective arms and the correlation analysis, the null hypothesis was rejected, and the alternate hypothesis was retained. It was concluded that an EHR alert to screen patients with a BMI of 30 or greater for depression during a primary care visit affects early identification and treatment of depression. National guidelines recommend screening patients for obesity. However, evidence from the literature found that providers did not routinely screen those with a BMI of 30 or greater for depression, which was consistent with the results in the retrospective study where screening was observed to be only 21.21%. Considering this study's results, healthcare providers should be informed about the benefits of using electronic alerts to detect patients with a BMI of 30 or greater for depression. Hopefully, this study will add to the body of literature, and in the long run improve future healthcare practices. Healthcare policies have already been created, and this quality improvement project showed one way to improve adherence to national organizations' policies.

Clinical Practice Implications

This study has practical implications for healthcare providers. The United States Preventative Service Task Force (USPSTF) recommended screening for depression for all patients in primary care, ages 18 to 99, who are diagnosed with a BMI of 30 or greater (Tronieri et al., 2019). Integrating EHR alerts into patient charts in this study has been shown to prompt providers to screen with a PHQ-9 tool in those patients with a BMI of 30 or greater for early identification and treatment 53% more often in comparison to when there were no electronic prompts. The early screening allowed providers to initiate therapy earlier with pharmacology, psychotherapy, or both.

The clinical electronic reminders could hopefully improve provider’s compliance with following standards of practice related to screening medical conditions, which may, in return,

decrease the burden of comorbid conditions, including cardiovascular, endocrine, and psychological conditions of anxiety and depression. Integrating an EHR alert for early identification and treatment of depression would lessen the impact of mental health on patient's socioeconomics and health related to unemployment, frequency of hospitalizations, substance and alcohol abuse, and suicide. Furthermore, integrating EHR alerts would improve communication between healthcare providers for care coordination, help streamline workflow, ensure that screenings are routinely done at each primary care visit, and in return decrease the healthcare costs from undiagnosed and untreated mental and health conditions such as depression and obesity. The benefits of integrating EHR alerts could hopefully lead to improved patient outcomes and efficient health care delivery.

Future Implications

This study might be important for researchers interested in the effect of implementing electronic alerts on screening for medical conditions. A future study on the variables of a BMI of 30 or greater and depression could be created as a longitudinal design and examine if providers in a primary care office would sustain that screening of patients after six months or one year of EHR alert integration or default to prior habits. This information could help providers identify barriers, such as patients who may be reluctant to talk initially but open up about their depression symptoms with screening.

The project design might be implemented at other primary care practices not only locally but also globally. EHR alerts increased screening rates for those with a BMI of 30 or greater to identify and treat their depression. Early screening was encouraging for patient's engagement, participation in their treatment plan, health maintenance, and follow- up care. Electronic alerts were helpful prompts to increase provider compliance with clinical guidelines and standards of

practice, especially when gaps in the literature indicated that providers were not routinely screening patients with a BMI of 30 or greater to identify depression due to time constraints and increased workflow (Blackstone et al., 2022).

Considering this study's results, changes to nursing practice could include educational in-service for staff and providers on how to use EHR alerts to benefit patient care. The training might also highlight the evidence-based practice guidelines on the benefits of EHR alerts to screen for medical conditions, including depression. Improving adherence to recommended clinical practice guidelines could lead to improved patient outcomes.

Conclusion

Based on the results of this study, it was concluded that an EHR alert to screen patients with a BMI of 30 or greater for depression during a primary care visit affects early identification and treatment of depression. The literature review noted a consistent bidirectional relationship between obesity and depression, and both conditions should be identified earlier (Garg et al., 2019). Most patients who are struggling with obesity could experience increased symptoms of depression, which could contribute to low socioeconomic status, hospitalizations, other comorbid conditions, insomnia, substance and alcohol abuse, and suicide (Liu et al. 2023). The United States Preventative Service Task Force (USPSTF) recommended screening those for depression ages 18 to 99 in primary care (Tronieri et al., 2019). Adding an EHR alert to screen those patients with a BMI of 30 or greater would remind providers to screen patients for depression using the PHQ-9 screening tool, which is the gold standard. If providers are prompted to screen by EHR alerts, this prompt would improve screening (Pfoh et al., 2020; Rudisill et al., 2016). Screening would allow providers to follow standards of care, identify those patients early, provide treatment for depression, and decrease disparity of care (Samples et al., 2019). This

quality improvement project showed ways to improve and adhere to policies that have been put in place for standards of practice. The following steps for research would be to disseminate and develop protocols and evidence-based guidelines. Providing education and training sessions for staff and healthcare providers, collaborating with mental health providers, and sharing findings through workshops may lead to improved healthcare outcomes for those patients diagnosed with a BMI of 30 and greater and suffering from undiagnosed depression.

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Appendix A

Patient Health Questionnaire (PHQ-9)

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

	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 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	0	1	2	3					

newspaper or watching television									
8. Moving or speaking so slowly that other people could have noticed. Or the opposite- being so fidget and 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	0	1	2	3					

If you checked off any problems, how difficult have these problems made it for you to do your work, take of things at home, or get along with other People? Not Difficult Someone difficult Very difficult Extremely difficult

Total Score	Depression severity
1-4	Minimal Depression
5-9	Mild Depression
10-14	Moderate Depression
15-19	Moderately severe Depression
20-27	Severe Depression

Appendix B

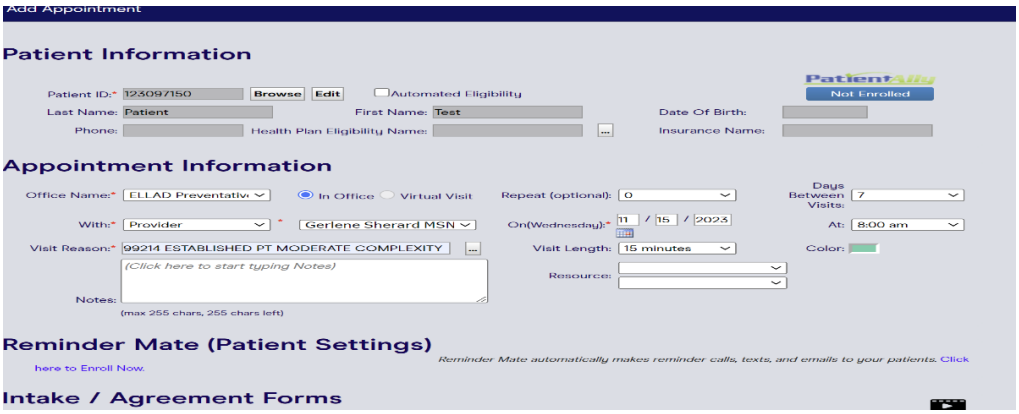
PHQ-9 Tool Permission

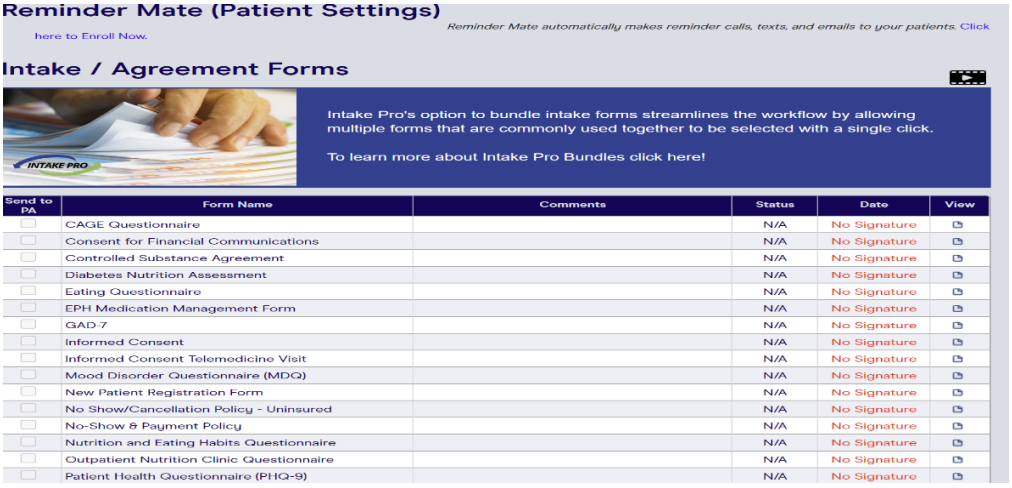
The APA is offering a number of "emerging measures" for further research and clinical evaluation. These patient assessment measures were developed to be administered at the initial patient interview and to monitor treatment progres They should be used in research and evaluation as potentially useful tools to enhance clinical decision-making and not as the sole basis for making a clinical diagnosis. Instructions, scoring information, and interpretation guidelines are provided; further background information can be found in DSM-5-TR. The APA requests that clinicians and researchers provide further data on the instruments' usefulness in characterizing patient status and improving patient care at http://www.dsm5.org/Pages/Feedback-Form.aspx.

Measure: Severity Measure for Depression—Adult (adapted from the Patient Health Questionnaire–9 [PHQ-9])
Rights granted: This measure can be reproduced without permission by researchers and by clinicians for use with their patients.
Rights holder: This measure was adapted from the Patient Health Questionnaire 9 (PHQ-9), which is in the public domain (http://www.phqscreeners.com/instructions/instructions.pdf). The original measure was developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues, with an educational grant from Pfizer Inc.
To request permission for any other use beyond what is stipulated above, contact: The measure is in the public domain and can be used without permission.

Appendix C

PHQ Integration in EHR





Appendix D

Letter of Support

LETTER OF SUPPORT

PERMISSION TO USE PREMISES, AND/OR SUBJECTS

Dear Georgia Dickerson,

I, Gerlene Sherard, a student of Radford University, School of Nursing with Dr. Milena Staykova, chair of my DNP Committee, would like to kindly request your permission to use the premises of (ELLAD Preventative Health) and recruit subjects to conduct a study entitled Depression and Obesity ". In patients with a BMI of 30, how does an EHR alert to screen for depression during primary care visit affect identification and treatment of depression ?. Depression is among the most prevalent chronic mental illness affecting individuals in all clinical settings (Ettman et al.,2020). Time constraints and less patient engagement decrease utilization of patient involvement with shared decision-making with treatment, and lack of psychosocial resources significantly impact identifying individuals with depression (Jha et al., 2019). Obesity and depression have a close relationship, which can increase disparities in care due to a lack of standardized routine screening for depression (Samples et al., 2019). Other evidence-based studies suggest utilizing standardized screening tools such as the patient health questionnaire (Phq-9) will help identify patients early with depression who are obese and prevent sequelae of events such as job loss, alcohol, substance abuse, or suicide (William et al., 2018). Identifying interventions and guidelines for healthcare practitioners help capture patients with depression and provide treatment and management. The purpose of this study is to find if an EHR alert for depression screening during the initial visits leads to early identification and treatment of patients with depression.

Institutional Review Board approval will be obtained before the initiation of the study.

Please check any that apply:

✓ I hereby authorize ……., Gerlene Sherard of Radford University School of Nursing, to recruit subjects for participation in a conduct a study entitled "In patients who are obese how does depression screening impact the identification and treatment at the initial visit?".

___ I hereby authorize Gerlene Sherard, student of Radford University School of Nursing, to use…. ELLAD Preventive Health} identified above when publishing results from the study "In patients who are obese how does depression screening impact the identification and treatment at the initial visit?".

/ Georgia Dickerson / 11/13/2023

Signature Date

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