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Obstructive Sleep Apnea Screening And Sleep Specialist Referral In Outpatient Psychiatric Populations

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OBSTRUCTIVE SLEEP APNEA SCREENING AND SLEEP SPECIALIST REFERRAL IN OUTPATIENT PSYCHIATRIC POPULATIONS

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This DNP Project is accepted in partial fulfillment of the requirements for the degree Doctor of Nursing Practice.

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Abstract

Background: Obstructive sleep apnea (OSA) affects approximately 1 billion people globally and is highly prevalent in psychiatric patient populations. Comorbid OSA can worsen psychiatric symptoms and increase suicide risk. Despite calls for OSA screening in psychiatric patient populations, it is currently underrecognized in mental health settings.

Objective: A protocol was created for OSA screening and sleep specialist referral for individuals seeking medication management services at a community mental health center.

Methods: Using the STOP-Bang questionnaire, a well-validated screening tool for OSA, individuals with positive screenings for OSA risk were referred to a sleep specialist during a 10-week implementation period.

Results: Prior to implementation, no screenings and two sleep specialist referrals were identified by medical record review. Among 149 individuals screened, 103 had positive screenings, indicating moderate or high risk for OSA, similar to the expected population prevalence. A total of 65 individuals accepted referral to a sleep specialist.

Discussion and conclusion: Results suggest the protocol is feasible and sustainable and that adequate screening will uncover high rates of undiagnosed OSA in psychiatric patient populations, potentially resolving many complaints of sleep disturbance. This DNP Project protocol provides an easily accessible means for OSA screening and sleep specialist referral in psychiatric patient populations.

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Part 1

Obstructive Sleep Apnea Screening and Sleep Specialist Referral in Outpatient Psychiatric Populations

Introduction

Obstructive sleep apnea (OSA) is estimated to affect approximately one billion people worldwide (Benjafield, 2019). The number of individuals with OSA is rising in all countries, and untreated OSA is predicted to be a substantial economic burden globally in the future (Lyons et al., 2020). The United States has approximately 54 million cases of OSA, and almost 80% of these individuals are undiagnosed and untreated, increasing general healthcare costs by $149.6 billion dollars in 2015 (American Academy of Sleep Medicine, 2016; Benjafield et al., 2019). From 1993 to 2010, recognition of OSA increased nationwide, mostly in primary care, pulmonology, and otolaryngology, but mental health providers' awareness of OSA remains low (Garbarino et al., 2020; Gupta & Simpson, 2015; Kaufmann et al., 2017; Namen et al., 2016).

Psychiatric patient populations are particularly affected by OSA. Individuals with major depressive disorder have a prevalence of OSA between 35% and 48.1%, and individuals with OSA are 3.11 times more likely to have depressive symptoms compared to those without any type of sleep-disordered breathing (Garbarino et al., 2020; Gupta & Simpson, 2015; Kaufmann et al., 2017; Stubbs et al., 2016). Individuals with schizophrenia suffer from OSA in rates as high as 57.1%, and numbers in bipolar disorder may be even greater, with observed rates up to 66% (Gupta & Simpson, 2015; Kelly et al., 2013; Myles et al., 2016; Stubbs et al., 2016; Varadharajan & Grover, 2021). Evidence is building for the relationship between OSA and other psychiatric disorders, with data showing a 48.4% prevalence of anxiety symptoms and 42.7% prevalence of post-traumatic stress disorder (PTSD) among individuals with OSA (Gupta & Simpson, 2015; Heck & Zolezzi, 2015; Lee et al., 2015; Su et al., 2015). Additionally, psychiatric medications may contribute an iatrogenic impact on global OSA burden, as many common psychiatric medications are known to exacerbate existing OSA through a wide variety of

mechanisms including respiratory suppression, increased airway collapsibility, and development of metabolic syndrome (Hsu et al., 2021; Khazie et al., 2018; Rishi et al., 2010; Robillard et al., 2022).

Problem Statement

In the modern healthcare landscape, OSA is widely underrecognized among mental health providers, and psychiatric patient populations are not commonly screened for OSA (Alam et al., 2012; Copps et al., 2015; Giles et al., 2022; Talih et al., 2017). Over the past 20 years, however, more and more experts are calling for increased awareness and screening of OSA in psychiatric patient populations (Bishop et al., 2018; Garbarino et al., 2020; Knechtle et al., 2019; Nikolakaros et al., 2015; Sharafkhaneh et al., 2005). The American Academy of Sleep Medicine (2016) has called upon mental health providers to be more involved in the care of OSA.

One option for mental health providers to use in screening for OSA is the STOP-Bang questionnaire, a set of eight dichotomous questions targeting the clinical presentation of OSA (Chung et al., 2016). This DNP Project developed and implemented a screening protocol using the STOP-Bang questionnaire screening tool for OSA and a sleep specialist referral process among patients at an outpatient mental health office in the Southern United States, with the intended outcome of increasing completed OSA screenings and sleep specialist referrals.

Significance

While OSA is not a psychiatric condition, its consequences can impact the ability of mental health providers to properly assess psychiatric symptoms and accurately diagnose psychiatric disorders. The overlap in symptoms of OSA and depression can result in misdiagnosis of the latter and result in unnecessary prescriptions of psychiatric medications. Insomnia, excessive daytime sleepiness, fatigue, avolition, poor concentration, poor memory, cognitive impairment, and decreased libido are commonly seen in both OSA and depression, causing clinical confusion (Braitman, 2018; Lin & Winkelman, 2012; Uyar et al., 2011; Vanek et

al., 2020). Many of these symptoms also commonly occur in individuals with bipolar disorders or schizophrenia spectrum disorders (Barateau et al., 2017; Knechtle et al., 2019).

Individuals with OSA are more than twice as likely to develop depression within one year compared to individuals without any type of sleep-disordered breathing (Chen et al., 2013). Individuals with OSA may be less likely to respond to treatment with antidepressants (Waterman et al., 2016), and symptoms of depression may be more severe with comorbid OSA (Reddy et al., 2022). Individuals with OSA and an affective disorder report lower quality of life in both mental and physical domains (Björnsdóttir et al., 2016). Emerging evidence shows when individuals are referred to sleep specialists, treatment of OSA can decrease symptoms of unipolar and bipolar affective disorders, anxiety disorders, and schizophrenia spectrum disorders, assisting providers in improving patients' lives (Aro et al., 2021; Campos-Rodriguez et al., 2016; Giles et al., 2022; Jackson et al., 2021; Lundetræ et al., 2021; Yang et al., 2020).

One of the most arresting reasons for mental health providers to acknowledge OSA is the disease's link to suicide, inarguably the worst outcome in psychiatric patient populations. Associations between OSA and suicide exist among patient populations with depression, anxiety, PTSD, and other psychiatric illnesses (Gupta & Jarosz, 2018; Kaufmann et al., 2017; McCall et al., 2019; Tseng et al., 2019). Over 20% of individuals with untreated OSA may have suicidal ideation (Choi et al., 2015; Timkova et al., 2020). Individuals with OSA have increased risk of death by suicide when compared to individuals without any type of sleep-disordered breathing (Udholm et al., 2022). Greater awareness of OSA can save lives, as a referral to a sleep specialist for treatment is shown to reduce risk of suicide attempts (Bishop et al., 2020). Given this data, it is clear that outcomes in psychiatric patient populations can be improved with greater OSA awareness, OSA screening, sleep specialist referral, and OSA treatment.

Background

Review of Literature

This literature search focused on the following domains of OSA: epidemiology; pathophysiology; mental and physical health risks; screening options; and treatment options. Databases used were PubMed, Ovid Medline, Scopus, and the Cochrane Library. *Apnea* is the preferred spelling in the United States, whereas *apnoea* is common in many other parts of the world, so both terms were used. Additional search terms were chosen to capture a wide array of articles and included *psych**, *menta**, *depress**, *bipol**, *schiz**, *suicid**, *epidemiol**, *screen**, and *risk**. A table showing the full search strategy can be found in Appendix A. Searches covered literature published from 2011 to 2022; as more than 25,000 articles were found in this time range, research prior to 2011 was not included in initial searches to allow manageable title screening. Additionally, many other articles were found in reference lists.

From all sources, a total of 25,384 articles were discovered. After screening titles for suitability and removing duplicates, 1,143 articles were moved to abstract screening. Then, 398 were selected for full-text review, which was completed from December 2021 to June 2022. Ultimately, 180 articles were included in the review of literature. Inclusion criteria included peer-reviewed sources, articles written in English, and reasonable generalizability to the United States. Exclusion criteria included studies with a quality grade of C based on the Johns Hopkins guidelines for evidence-based practice in nursing (Dang et al., 2021), studies with small sample sizes, and studies already adequately represented in systematic reviews or meta-analyses. A summary of this process can be found in the PRISMA flow chart in Appendix B.

Synthesis of Current Knowledge

Since recognition of OSA began in the 1970s, evidence of its psychiatric impact has accumulated. Individuals with OSA appear more likely to suffer from virtually every psychiatric illness. Treatment of OSA may improve psychiatric symptoms and prevent suicides. Obstructive

sleep apnea also results in numerous physical health comorbidities. This review of literature will address these topics, as well as the screening and treatment of OSA.

The Definition and Epidemiology of OSA

Obstructive sleep apnea is the most common sleep disorder in the world (Smith, 2021). In OSA, hypopneas and apneas—partial or complete upper airway obstructions—occur in sleep, resulting in oxyhemoglobin desaturation and arousals (Smith, 2021). The severity of OSA is determined by the Apnea Hypopnea Index (AHI), the number of apneas or hypopneas per hour slept (Kapur & Donovan, 2019). An AHI of 5 to 15 constitutes mild OSA, 15 to 30 constitutes moderate OSA, and greater than 30 constitutes severe OSA (Smith, 2021). Signs and symptoms of OSA include insomnia, sleep fragmentation, snoring, gasping, choking, excessive daytime sleepiness, and morning headaches (Arredondo et al., 2021). An obstacle in recognizing OSA is that around 25% of individuals are asymptomatic (Donovan et al., 2020; Smith, 2021). Male sex at birth, higher BMI, and older age are the greatest risk factors for OSA (Peppard & Hagen, 2018; Senaratna et al., 2017a; Wu et al., 2020). Other risk factors include large neck circumference and craniofacial abnormalities (Ralls et al., 2021). No single factor is likely the most important in developing OSA (Ralls et al., 2021).

Worldwide, around 1 billion people have OSA (Benjafield et al., 2019). The United States has approximately 54 million individuals with OSA, 43.2 million being undiagnosed (American Academy of Sleep Medicine, 2016; Benjafield et al., 2019). Often viewed as a disease of men, recent literature shows females may be affected at higher rates than previously known (Geer & Hilbert, 2021; Peppard & Hagen, 2018). Young people are also affected, and the United States is estimated to have 2.2 million children and adolescents with OSA (Bodenner et al., 2014).

Health Consequences of OSA

Virtually every organ system is negatively affected by OSA (Espiritu, 2021; Mirta et al., 2021). Individuals with OSA are up to 15 times more likely to have metabolic syndrome compared to those without OSA (Kariuki et al., 2021; Rohtagi et al., 2018). The presence of

OSA predicts prediabetes (Seicean et al., 2008; Yu et al., 2021), and meta-analysis shows individuals with OSA are 3.62 times more likely to have diabetes compared to those without OSA (Wang et al., 2022). With OSA and diabetes together, severe renal damage is more common (Liu et al., 2021), and cardiovascular mortality increases (HR 2.37, 95% CI 1.16-4.82, p=0.02) (Labarca et al., 2021). High cholesterol and high triglycerides are associated with OSA (Nadeem et al., 2014; Patinkin et al., 2017). Obstructive sleep apnea attenuates weight loss, making it more difficult to achieve health goals (Borel et al., 2012).

Across all ages, OSA is strongly associated with hypertension (Kapur & Weaver, 2012; Patinkin et al., 2017; Salman et al., 2020; Young et al., 2009). Compared to the general population, atrial fibrillation, bradycardia, stroke, atherosclerosis, ventricular hypertrophy, and myocardial infarction are all more common among individuals with OSA (Lin et al., 2022; Lu et al., 2021; Mitra et al., 2021; Porto et al., 2016; Tang et al., 2022; Teo et al., 2022). Sudden cardiac death is predicted by the presence of OSA (Gami et al., 2013; Salari et al., 2022).

Strong associations exist between OSA and all-type cancer (Cheng & Li, 2021; Cheong et al., 2022; Marshall et al., 2014; Xiong et al., 2022). Individuals with OSA are more likely to die when any cancer occurs (HR 3.4, 95% CI 1.1-10.2) (Marshall et al., 2014), and poor treatment response is associated with OSA (Lacedonia et al., 2021; Xiong et al., 2022).

People with OSA are 8 times more likely to be infected with the COVID-19 coronavirus and have nearly double the risk (OR 1.98, 95% CI 1.65-2.37) of respiratory failure when infected (Maas et al., 2021). When an individual with OSA has COVID-19, risk of death increases 2.590 times (95% CI 1.22-5.51) (Voncken et al., 2021). Untreated OSA raises risk of acute respiratory distress syndrome, a potentially fatal development of COVID-19 (Labarca et al., 2022).

Men with OSA may suffer from erectile dysfunction and decreased libido (Kellesarian et al., 2018, Mun et al., 2018). Women with OSA are more likely to report decreased libido, inability to achieve orgasm, and decreased satisfaction with sex (Kabak & Akbudak, 2021). For those trying to conceive, OSA reduces female fertility (OR 2.10, p<0.001) (Lim et al., 2021).

Many other associations with OSA exist. Death from all causes is associated with OSA (Kendzerska et al., 2014; Lechat et al., 2021; Punjabi et al., 2009). Moderate to severe OSA are especially associated with an increase in all-cause mortality (HR 4.2, 95% CI 1.9-9.2) (Marshall et al., 2014). When an individual with OSA has an organ transplant, graft loss or death of the individual are more common (Lubas et al., 2019). Individuals with OSA are particularly prone to psoriasis, with a prevalence up to 81.8% (Gupta et al., 2016a). High-risk pulmonary emboli occur more often (OR 1.96, 95% 1.14-3.34) in moderate to severe OSA (Xu et al., 2021). A 27.1% prevalence of irritable bowel syndrome has been shown when OSA is present (Ghiasi et al., 2017). Individuals with OSA are 1.64 times more likely (95% CI 1.25-2.16, p=0.0005) to be involved in a workplace accident (Chou et al., 2022). Numerous other health consequences of OSA exist but are far beyond what can be succinctly described in this review of literature.

Links Between OSA and Psychiatric Illness

Individuals at outpatient mental health offices frequently have undiagnosed OSA, with rates up to 35.3% in men and 20.6% in women (Anderson et al., 2012; Nikolakaros et al., 2015; Uyer et al., 2011). Inpatient psychiatric populations have greater risk, with prevalence between 39.5% and 58.2% (Talih et al., 2017; Tanielian et al., 2020). Individuals with OSA report greater mental health care use while simultaneously reporting more unmet needs, meaning they are more likely to access care but less likely to perceive benefits (Kaufmann et al., 2017).

Suicide. Individuals with OSA are 2.75 times more likely (95% CI 2.34-3.23) to suffer suicidal ideation and 1.56 times more likely to have a plan for suicide (95% CI 1.08-2.26) (Bishop et al., 2018; Kaufmann et al., 2017). Major depressive disorder and OSA together are associated with a 27% higher risk of suicidal ideation or suicide attempt (Reddy et al., 2022). Multiple studies show associations between untreated OSA and greater risks of suicidality when compared to treated OSA (Choi et al., 2015; McCall et al., 2019; Timkova et al., 2020; Udholm et al., 2022). Referring individuals with OSA to sleep specialists may save lives, as seeing a sleep specialist is associated with fewer reports of suicidality (Bishop et al., 2020).

It is long established that sleep disturbance of any kind, including OSA, predicts suicide (Dong et al., 2020; Porras-Segovia et al., 2019). Individuals in the general population with any sleep disturbance have a 1.80-fold higher risk (95% CI 1.32-2.44, $p<0.01$) of death by suicide (Dong et al., 2020). In individuals with psychiatric illnesses and sleep disturbance, the odds of suicide increase to 1.99 (95% CI 1.72-2.30, $p<0.001$) (Malik et al., 2014).

Unipolar Affective Disorders. A bidirectional relationship between OSA and unipolar affective disorders exists. One systematic review showed 35% percent of individuals with OSA have symptoms of depression (Garbarino et al., 2020). Another systematic review estimated 48.1% of individuals with depression have OSA (Gupta & Simpson, 2015). Symptoms of depression and symptoms of OSA overlap, leading to misdiagnosis or confusion (Edwards et al., 2020). Individuals with OSA and depression may be less likely to respond to antidepressants, so it has been recommended to screen for OSA prior to antidepressant use (Aftab et al., 2021; McCall et al., 2019; Reddy et al., 2022; Waterman et al., 2016).

Treatment of OSA with continuous positive airway pressure (CPAP) was once thought to have negligible or modest effects on depression (Gupta et al., 2016b; Yang et al., 2020). Recently, evidence showed CPAP treatment resolves depressive symptoms and improves quality of life (Aro et al., 2021; Campos-Rodriguez et al., 2016; Jackson et al., 2021; Walker et al., 2021; Yang et al., 2020). The largest cohort study to date showed a significant decrease in depressive symptoms with CPAP (Lundetræ et al., 2021). When depressive symptoms are severe, CPAP treatment results in greater improvement (Povitz et al., 2014; Yang et al., 2020).

Bipolar Affective Disorders. A systematic review showed a median OSA prevalence of 19.8% among individuals with bipolar disorder but noted studies saw rates as high as 66% (Gupta & Simpson, 2015). One study tracking OSA screening in patients with bipolar disorder showed 88.6% of those completing a sleep study were found to have OSA (Kelly et al., 2013).

Schizophrenia Spectrum Disorders. The prevalence of OSA among individuals with schizophrenia or psychotic symptoms is as high as 57.1% (Myles et al., 2016). Individuals with

schizophrenia have higher risk of OSA even after adjusting for other risk factors (Knechtle et al., 2019; Wu et al., 2020). Individuals with schizophrenia and sleep disturbance are 12.66 times more likely (95% CI 1.40-114.44, p=0.02) to die by suicide (Malik et al., 2014). Evidence reveals schizophrenia does not affect adherence rates to CPAP treatment, and response is equally favorable among individuals with and without psychotic symptoms (Giles et al., 2022; Myles et al., 2018; Saoud et al., 2020). Treatment may also improve the negative or cognitive symptoms of schizophrenia (Bottlender & Möller, 1999; Boufidis et al., 2003; Sugishita et al., 2010).

Anxiety and Trauma- and Stressor-Related Disorders. The prevalence of anxiety disorders may be as high as 48.4% among individuals with OSA (Lee et al., 2015). Individuals with OSA may have a higher risk of panic disorder (Su et al., 2015). The median prevalence of PTSD is 42.7% among individuals with OSA (Gupta & Simpson, 2015). A greater severity of OSA is associated with suicidal ideation among individuals with PTSD (Gupta & Jarosz, 2018).

Neurocognitive Disorders. The development of Alzheimer's disease is associated with OSA (Bubu et al., 2020; Przybylska-Kuć et al., 2019). Having OSA is associated with a 1.27 times increased risk of dementia (95% CI 1.04-1.54) (Shieu et al., 2022). Treatment with CPAP may improve mild cognitive impairment and speed of information processing, and evidence suggests treatment of OSA may delay deterioration among individuals with Alzheimer's disease (Liguori et al., 2021; Want et al., 2020; Vigorè et al., 2021).

Neurodevelopmental Disorders. Evidence shows many symptoms of attention-deficit hyperactivity disorder (ADHD) may be secondary to untreated OSA (Youssef et al., 2011). Treatment of OSA can improve inattentive and hyperactive symptoms for many individuals initially thought to have ADHD (Sedky et al., 2014; Youssef et al., 2011; Wang et al., 2020).

Iatrogenic Concerns. Users of second-generation antipsychotics are 4.53 times more likely to develop OSA, and they have a 1.9 times greater chance (95% CI 1.1-3.3) of severe OSA (Rishi et al., 2010; Shirani et al., 2011; Wu et al., 2020). Antipsychotics have been shown to worsen respirations during sleep, exacerbating OSA (Khazie et al., 2018; Rohtagi et al.,

2018). Benzodiazepines also exacerbate OSA through respiratory suppression or increased airway collapsibility (Akashiba et al., 2022; Gupta & Simpson, 2015; Hsu et al., 2021). Benzodiazepines may result in longer times to rouse after airway collapse, worsening outcomes in OSA (Heck et al., 2015; Lin & Winkelman, 2012). Users of benzodiazepines with OSA have a 28.6 times greater risk (95% CI 5.24-156) of acute respiratory failure (Wang et al., 2019). Antidepressants may increase AHI count and worsen OSA severity (Robillard et al., 2022; Smith, 2006).

Effect on Bedpartners. Interpersonal relationships are negatively affected when OSA worsens sleep quality for affected individuals and their bedpartners (Beninati et al., 1999; Parish & Lyng, 2003; Smith et al., 2009). Treatment of OSA improves quality of life for both affected individuals and spouses (Tegelberg et al., 2012; Yazici & Hatipoglu, 2019).

Screening for OSA in Outpatient Settings

Obstructive Sleep Apnea Screening Tools. An array of OSA screening tools exists. One tool is the STOP-Bang questionnaire, which features 8 dichotomous questions identifying the following: snoring, daytime tiredness, witnessed choking or gasping, hypertension, body mass index, age, neck circumference, and sex at birth (Chung et al., 2016). The STOP-Bang questionnaire's scoring ranges from 0 to 8, with each item counting for 1 point (Chung et al., 2016). The tool's sensitivity in detecting any severity of OSA is 90% or greater (Le Grande et al., 2021; Nagappa et al., 2015). The STOP questionnaire, a precursor to the STOP-Bang questionnaire, uses only the first four questions of the STOP-Bang questionnaire and is still occasionally seen in clinical practice and research (Chung et al., 2008; Patel et al., 2022).

The Berlin questionnaire is also a validated screening tool for OSA, and it asks for an individual's height and weight plus 10 questions, sorted into categories of snoring and cessation of breathing; daytime sleepiness; and body mass index and hypertension (Chiu et al., 2017; Senaratna et al., 2017b). Unfortunately, the sensitivity of the Berlin questionnaire has a wide range: its sensitivity in detecting clinically relevant OSA may be as high as 89%, but depending

on how OSA is defined, it can plummet to as low as 43% (Senaratna et al., 2017b). A recent systematic review and meta-analysis of the Berlin questionnaire found it to be effective in sleep clinic patient populations, but more evidence is needed before it is confirmed to be effective in the general population (Senaratna et al., 2017b).

The Lausanne NoSAS is a recent contender among OSA screening tools, and it consists of five parameters: neck circumference, weight, presence of snoring, age, and sex at birth (Chen et al., 2022). A recent meta-analysis found it to have a sensitivity of 79.8% and specificity of 58.2% (Chen et al., 2022). Other screening tools employed in detection of OSA include the Epworth Sleepiness Scale, the Pittsburgh Sleep Quality Index, the Wisconsin sleep questionnaire, the Mallampati Upper Airway Score, and the 4-Variable (Dyrbuś et al., 2022; Etain et al., 2022; Rosenberg et al., 2022; Silva et al., 2011; Teculescu et al., 2003).

Screening Practices. There are no universal guidelines for OSA screening in the United States (Miller & Berger, 2016). Based on analysis of benefits versus harms, the consensus among experts is that insufficient evidence exists to warrant screening for OSA in the general population (US Preventive Services Task Force et al., 2022), but this recommendation is limited in that it includes asymptomatic members of the general population and looks only at CPAP and mandibular devices as treatment options, eschewing surgical and weight loss interventions. When looking at symptomatic or high-risk individuals of the general population or specialty populations, the literature clearly recommends screening for OSA (Bishop et al., 2018; Bitners & Arens, 2020; Epstein et al., 2009; Garbarino et al., 2020; Knechtle et al., 2019; Malhotra & Zeballos-Chavez, 2021; Nikolakaros et al., 2015; Sharafkhaneh et al., 2005).

Despite recommendations to screen at-risk patients, such as individuals with hypertension, morbid obesity, or symptoms of OSA, most primary care providers do not screen for OSA (Ononye et al., 2019). Among individuals at high-risk for OSA, fewer than one-third are screened for OSA (Arsic et al., 2022). Even when providers are aware of OSA, the only factor

influencing sleep specialist referral is patients themselves inquiring about OSA (Williams et al., 2015).

A quality improvement project using the STOP-Bang questionnaire in a primary care setting showed a single educational inservice increased rates of OSA screening from 3% to 43% and sleep specialist referral from 0% to 39% over a 14-week period (Ononye et al., 2019). Another study showed continuing medical education for OSA resulted in participating primary care physicians being 2.86 times more likely to screen for OSA (Johnson et al., 2015).

Outside of primary care, it is thought there is less awareness of OSA among mental health providers (Barateau et al., 2017; Myles et al., 2016). Symptoms of depression or anxiety result in decreased chances of being referred to a sleep specialist, indicating individuals with mental illness are screened less often (Wickwire et al., 2020). Few articles on OSA screening in outpatient mental health settings are found in the literature. A quality improvement project from 2012 screened for OSA in an outpatient population with severe mental illness, and 69% were considered high-risk for OSA (Alam et al., 2012). A pilot study in 2011 concluded high rates of undiagnosed OSA exist among community mental health patients (Anderson et al., 2012).

Selecting a Screening Tool for Use in Outpatient Psychiatric Settings

The STOP-Bang Questionnaire. No OSA screening tool is validated in psychiatric patient populations, but the STOP-Bang questionnaire is validated in more diverse populations than any other tool (Bernhardt et al., 2021; Chiu et al., 2017; Le Grande et al., 2021; Luo et al., 2014; Miller et al., 2018). In comparisons with other tools, the STOP-Bang questionnaire performs better in sensitivity (Costa et al., 2020; Wang et al., 2021). One of the largest meta-analyses available shows its sensitivity to be 90% for mild OSA, 90% for moderate OSA, and 95% for severe OSA (Bernhardt et al., 2021). A trade-off of high sensitivity is that the STOP-Bang questionnaire performs less well in specificity, with 37% specificity for mild OSA, 27% specificity for moderate OSA, and 28% specificity for severe OSA (Bernhardt et al., 2021). Other common screening tools may outperform the STOP-Bang questionnaire in specificity (Chen et

al., 2022; Chiu et al., 2017). It is of note, though, that all common screening tools for OSA have relatively poor specificity (Le Grande et al., 2021).

The STOP-Bang questionnaire has been validated in populations across North America, South America, Europe, the Middle East, and parts of Asia, indicating utility in varied settings (Pivetta et al., 2021). A score of 3 or above on the STOP-Bang questionnaire indicates a need for evaluation by a sleep specialist (Chung et al., 2014; Chung et al., 2016). Scores of 3 or higher are shown to have the best balance when considering both sensitivity and specificity (Chen et al., 2021; Farney et al., 2011; Nagappa et al., 2017; Pivetta et al., 2021).

Measurement of Neck Circumference in Psychiatric Patient Populations. The STOP-Bang questionnaire uses measurement of neck circumference, ostensibly requiring a provider to physically touch an individual. In contrast to primary care, individuals are rarely touched by providers in a mental health setting, and there is a reticence among mental health providers to touch patients (Ali et al., 2020; Hibner et al., 2017; Mead et al., 2021; Ross et al., 2018). Thus, there is concern mental health providers will avoid use of the STOP-Bang questionnaire due to measurement of neck circumference, but this criterion cannot be avoided, as it was included in all validation studies. Removing the neck circumference item results in comparable sensitivity in detecting moderate-to-severe or severe OSA, but the unaltered form has significantly higher sensitivity in detecting all severities of OSA (Wassem et al., 2022). In fact, on the STOP-Bang questionnaire, neck circumference is the *most* important item, as it alone is independently associated with OSA (Morinigo et al., 2022).

There is also concern about using the STOP-Bang questionnaire during telehealth or telephone appointments. No universally accepted method for virtual neck measurement has ever been established, and the literature has no clear precedent for individuals measuring their own neck circumference during telehealth or telephone encounters (Gruss et al., 2016). In articles using the STOP-Bang questionnaire during telehealth or telephone encounters, there is no explicit discussion of how measuring neck circumference was navigated (Alotaibi et al.,

2021; Donovan et al., 2017; Henry et al., 2022; Hirshkowitz & Sharafkhaneh, 2014). A 2022 review of telemedicine practices for patients with sleep-disordered breathing was also silent on the issue of how patients could complete a neck circumference measurement at home (Franceschini & Smurra, 2022). One study screening individuals by telephone removed the neck circumference item from the STOP-Bang questionnaire, but the authors noted this possibly resulted in excluding at-risk individuals (Frangopoulos et al., 2019).

Project Model

Kotter's 8-Step Process for Leading Change is a project model that allows individuals in leadership positions to successfully execute quality improvement projects (Kotter, 2014). It is one of the world's most used change models, and its utility has been established in a wide variety of healthcare settings (Harrison et al., 2021). Using Kotter's first step, "Create a sense of urgency," interest in screening for OSA was fostered by one-on-one conversations with individual providers. The second step, "Build a guiding coalition," was completed by assembling a team of motivated people including the office manager, nurse practitioners, physicians, and support staff. The third step, "Form a strategic vision and initiatives," was achieved with education sessions detailing the DNP Project's goals, highlighting the benefit to individual providers and patients. The fourth step, "Enlist a volunteer army," was done by recruiting the help of the clinicians who completed the screening and referral processes involved with this DNP Project. The fifth step, "Enable action by removing barriers," was carried out as the DNP Project progressed, streamlining steps that took too much time in the referral process. The sixth step, "Generate short-term wins," was completed by collecting data from successful screenings and referrals and distributing it to the engaged providers. The seventh step, "Sustain acceleration," was done by monitoring both the in-house employees completing screenings and referrals, making sure they were not overwhelmed with the tasks, and the local sleep specialist infrastructure, making sure the region's specialists were not overwhelmed by referrals. The

eighth step, “Institute change,” was completed by recommending integration of the screening and referral processes into everyday operations.

Organizational Assessment

System Description

The system hosting this DNP Project comprises multiple mental health outpatient offices and a psychiatric hospital located in the Southern United States. This non-profit system treats individuals of all ages, and services include psychiatric medication management, individual and group psychotherapy, intensive outpatient programs, peer support groups, social skills classes, case management, an in-house pharmacy, and medication-assisted treatment programs for individuals with substance use disorders.

Setting

This DNP Project took place at the system’s flagship outpatient center. This office services thousands of patients and has more than 60 employees, including psychiatrists, advanced practice registered nurses, registered nurses, licensed practical nurses, psychotherapists, peer support specialists, case managers, and receptionists. This office does not screen for OSA and has no official policy related to the assessment and treatment of sleep disorders, consistent with the literature findings that screening for OSA is rarely done in outpatient mental health settings (Gupta & Simpson, 2015; Kaufmann et al., 2017).

Need

Currently, providers at outpatient mental health centers may not be aware of the psychiatric consequences for patients when OSA is not detected and goes untreated. Without OSA screening, patients complaining of sleep disturbances are likely given treatment as usual, which typically involves discussions of sleep hygiene, referrals to psychotherapy, and the prescription of hypnotic medications. It is rare for OSA to improve without specialist treatment, however, as sleep hygiene interventions and medications do not treat the core physical problem of obstructive apneas. Without proper education from providers, patients may view their sleep

disturbance as a purely psychiatric problem; this can damage the alliance between provider and patient if the patient perceives they are not receiving adequate treatment, as when they still do not sleep well despite implementing recommended behavioral changes or using a series of hypnotic medications.

SWOT Analysis

Internal strengths at the DNP Project site included an engaged leadership and support staff who expressed interest in screening for OSA. The organization already employs staff nurses who complete specialty referrals, so implementing an additional referral option did not require substantial reallocation of staff members' duties or time. The DNP Project site has a large patient volume, so there were many opportunities to screen for OSA among patients who present with sleep complaints. Internal weaknesses would primarily be characterized by the perception among providers that OSA is simply not a psychiatric concern and would be better left to the primary care provider's office. Providers may be uninformed about the ramifications of OSA when untreated in psychiatric patient populations.

External opportunities for this DNP Project included an increasing number of experts calling for the screening of OSA in psychiatric patient populations. In the geographical area surrounding the DNP Project site, there was a fortuitously large number of sleep specialists available for referrals. There was the possibility of the DNP Project site becoming the area's first outpatient mental health center to integrate OSA and psychiatric care, allowing good publicity and the subsequent financial boons of treating patients who seek such coordinated care. With project success, nationwide recognition could lead to widespread use. External threats included strain to the network of sleep specialists: given the high volume of patients seeking treatment at the DNP Project site, a referral protocol that was *too* successful could overwhelm the available sleep specialists. As the literature identifies, there is no national inclination among psychiatric providers to screen or refer for OSA; psychiatric providers outside of the DNP Project site may also initially perceive a lack of benefit, as a screening and referral protocol for OSA would not

increase psychiatric providers' rates of reimbursement. Finally, the co-pay costs of sleep specialist visits and CPAP equipment are a burden for many patients, resulting in a screening and referral process that is technically successful but without positive patient outcomes if specialist treatment is unaffordable. Many commercial insurance plans cover treatment of OSA with CPAP, but the co-pay costs can be substantial. A figure showcasing the SWOT analysis is found in Appendix D.

Aims

This DNP Project developed and implemented an OSA screening and referral protocol using the STOP-Bang questionnaire screening tool and sleep specialist referral process at an outpatient psychiatric office in the Southern United States, with the intended outcomes of increased completed OSA screenings, sleep specialist referrals, and sleep study evaluations. This DNP Project had the following aims:

1. Develop an OSA screening and referral process for an outpatient psychiatric population.
2. Implement the OSA screening and referral process and evaluate completed screenings and referrals over a 10-week period.
3. Make recommendations for scaling and sustainability based on results, focusing on screening as a permanently accessible part of the electronic chart and incorporating education on OSA in the organization's employee training.

Part 2

Methods

Increased recognition of OSA in psychiatric patient populations is needed, and the nurses and physicians working in mental health are equipped with the skill set to screen for OSA. This DNP Project used a quality improvement design to implement OSA screening and sleep specialist referral into medication management appointments for new and existing patients at an outpatient community mental health clinic in the Southern United States. After training, providers used the STOP-Bang questionnaire to screen for OSA when patients reported sleep disturbances consistent with signs and symptoms of OSA. With positive screenings, patients were referred to a sleep specialist in the local area for further assessment. Evaluation of this quality improvement project included comparing the number of OSA screenings and sleep specialist referrals before and during the implementation period.

Project Aims and Steps

Aim 1: Develop an OSA screening and referral process for an outpatient psychiatric population.

Protocol Development.

- Assessed awareness and knowledge of OSA among providers at DNP Project Site.
    - Engaged in one-on-one conversations with nurse practitioners and physicians who complete medication management appointments at the DNP Project site.
    - Engaged in introductory meeting with administrators and office manager to assess readiness for a quality improvement project concerning OSA.
- Collected data on current frequency of OSA screenings and sleep specialist referrals at the DNP Project site.
    - Completed chart review in a sample 14-day period in May 2022 to search for indicators of OSA screening, and none were identified.

    - Identified 2 completed sleep specialist referrals in the same 14-day period.
- Selected a screening tool to use for OSA screening in psychiatric patient populations.
    - The STOP-Bang questionnaire was selected for screening based on its multiple validations in diverse populations and consistently superior sensitivity when compared to other OSA screening tools.
        - Confirmed the appropriate cutoff score of 3 that determines when to initiate a sleep specialist referral.
    - Completed contract granting permission to use screening tool.
    - Added fields to record visit type, who reported snoring, and how neck circumference was measured.
- Created a list of available sleep specialists in the local area, including the sleep specialist's name, place of business, address, phone and fax numbers, website information, and list of insurance plans accepted.
    - Focused on sleep specialists located in the same county as the DNP Project site.
        - As the DNP Project site provides services to many individuals in two neighboring counties, located at least one sleep specialist in each of these counties.
    - Verified sleep specialist contact information using the Google search engine.
    - Contacted and verified availability of each sleep specialist and determined preferred referral process (e.g., needed forms) for each provider on list.
- Developed a protocol for OSA screening and sleep specialist referral (Appendix C).

- Decided the number of target screenings and referrals.
    - Estimated the total number of patient visits conducted on a weekly and monthly basis, allowing a rough estimate of potential screenings.
        - At the DNP Project site, it was estimated that between 500 and 700 individuals per week are seen by seven nurse practitioners and three physicians for medication management appointments. Five of these nurse practitioners and one of these physicians were asked to participate in the implementation period.
            - Rationale for number of providers was based on expected prevalence of sleep disturbance, convenience sampling, and risk of overwhelming the sleep specialist referral network.
        - It was expected that a minimum of 70 to 100 OSA screenings would be completed, between all providers. Calculations included review of a prior quality improvement project that found 41% of severely mentally ill patients in an outpatient mental health clinic had sleep disturbances (Alam et al., 2012). In addition, in the same study, it was found that 69 of 100 individuals were high risk for OSA when screened with the STOP-Bang questionnaire (Alam et al., 2012). It was expected that between one-third and two-thirds of patients screened would have a positive STOP-Bang questionnaire screening (Garbarino et al., 2020; Gupta & Simpson, 2015; Kaufmann et al., 2017; Kelly et al., 2013; Myles et al., 2016).
        - It was expected that a minimum of 25 sleep specialist referrals would be completed. The maximum number of referrals was

initially planned to be held to 55 referrals to assure we did not overwhelm the network of sleep specialists: if each sleep specialist on the created list received 5 referrals, this would have totaled 55 referrals.

Education Development.

- Developed provider education presentation on OSA and the screening and referral protocol.
    - Topics included:
        - The definition of OSA.
        - The impact of OSA on mental and physical health.
        - How to screen for OSA and complete a sleep specialist referral.
        - The importance of neck circumference measurement when screening for OSA.
        - How OSA is treated.
        - The impact of treatment of OSA on psychiatric symptoms.
    - Demonstrated use of the STOP-Bang questionnaire.
    - Demonstrated how to use a measuring tape to measure neck circumference.
    - Addressed all questions or concerns from providers.
- Developed additional educational handouts for providers to refer to after the education presentation.
    - Created a simple, easily digestible outline of DNP Project steps for providers to keep in their offices.
- Reviewed project methods, aims, and goals with project site administration.
    - Got approval for DNP Project.

- Received exempt status from both the Yale IRB and the DNP Project site IRB.
- Developed DNP Project team and roles of team members.
  - Identified providers and other staff members at the DNP Project site to participate in the implementation period. Providers selected for participation comprised five advanced practice registered nurses (Psychiatric Mental Health Nurse Practitioners), one physician (psychiatrists), and one licensed practical nurse.
    - One selected nurse practitioner ultimately did not participate, as the individual's schedule did not allow attendance of an education/training session.
  - The number of nurse practitioners and physicians was determined primarily by those showing interest in being involved in the implementation period and agreeing to come to an education session. With five total providers, this comprised 50% of the practicing providers at the DNP Project site, so it was decided this was an adequate number of providers for a quality improvement project.
  - The number of staff nurses was predetermined to be four, as it was initially thought these four individuals complete all specialist referrals the DNP Project site, but ultimately only one licensed practical nurse was involved in the referral process.

- Completed a second chart review of completed OSA screenings and completed sleep specialist referrals immediately prior to the implementation period.
  - Reviewed the 7-day period prior to implementation.

        - The number of OSA screenings was found to be 0; the number of completed sleep specialist referrals was found to be 0.

Materials Preparation.

- Prepared materials for implementation.
    - Printed and distributed paper copies of the STOP-Bang questionnaire to providers.
        - Selected a colorful paper stock to make the screening tool conspicuous to providers.
    - Purchased measuring tapes online and delivered them to providers.
    - Printed and distributed paper copies of the sleep specialist list to the staff nurse who completes specialist referrals.

Aim 2: Implement the OSA screening and referral process and evaluate completed screenings and referrals over a 10-week period.

Implementation.

- Implemented education and training with providers on OSA screening and sleep specialist referral protocol during the first week of the implementation period.
    - Two nurse practitioners were educated during a 30-minute “lunch and learn” meeting, occurring during the lunch hour.
    - Two nurse practitioners were educated during a 45-minute “dinner and learn” meeting, occurring after work hours.
    - One psychiatrist was educated during a 30-minute discussion outside of work hours.
- Implemented 60-minute education session with one licensed practical nurse on use of sleep specialists list for referrals prior to the implementation period.
    - This occurred in the afternoon after work hours.

- New or existing patients were screened for OSA by participating providers using the STOP-Bang questionnaire when reporting complaints of any of the following: complaints of sleep disturbance not attributable to other known conditions; symptoms consistent with any type of sleep-disordered breathing; or clinical signs of OSA.
    - Signs and symptoms consistent with OSA, as identified by the review of literature, include insomnia, sleep fragmentation, snoring, choking, gasping, excessive daytime sleepiness, daytime fatigue despite adequate hours slept, and morning headaches.
  - When screened patients scored 3 or higher on the STOP-Bang questionnaire, providers had the option to initiate a referral to a sleep specialist by sending the designated staff nurse a message in the electronic medical record that said simply “Sleep Specialist Referral.” Providers were able to choose to include as many supplementary details as desired, but this was not required.
    - Referrals were completed by 1 licensed practical nurse, who verified referral materials and faxed them to a sleep specialist from the provided list. When the staff nurse received a fax confirmation from the designated sleep specialist, they recorded it as a completed referral.
    - If patients did not have insurance, they were referred to a local no cost healthcare center, which has sleep specialists as part of its network.
    - Providers turned in all completed STOP-Bang questionnaire screenings to a designated folder, which was kept in a secured location. Only the DNP Project coordinator had access to the completed STOP-Bang questionnaire screenings.

- If screenings were considered negative and did not lead to a sleep specialist referral, the completed STOP-Bang questionnaire forms were still turned in to keep an accurate count of all completed screenings.
- The patient's name was not included on the STOP-Bang questionnaire to maintain patient privacy.

- In 2020, following the beginning of the COVID-19 coronavirus pandemic, the DNP Project site began allowing medication management appointments for new and existing patients to be conducted via telehealth or telephone, and as of summer 2022, more than 50% of all appointments were still conducted via telehealth or telephone. If a telehealth or telephone visit, the patient was asked to measure their neck using materials found in their home. If a patient was male sex at birth or wore male clothing, they were asked if they knew their shirt size; a shirt size of 16 inches or greater would satisfy the neck circumference measurement criterion.
  - If a patient was unable to measure their own neck circumference at home, the STOP-Bang questionnaire screening could be deferred at the clinician's discretion; the next appointment could be scheduled for an in-person assessment to obtain the needed neck measurement, provided the patient was agreeable to coming in-person.
  - While no literature guidance was discovered on this topic, providers had discretion to conclude a patient's neck circumference is 16 inches or greater based on visual inspection. This was to be done only if the patient's neck outwardly appeared

to be substantially larger than 16 inches and was at the provider's discretion to employ. If the patient's neck did not appear to be substantially larger than 16 inches, providers were instructed to not rely upon a visual inspection for estimation of neck circumference.

- Screened patients with a score of 2 or lower were considered to have a negative screening, and no sleep specialist referral was initiated.
- Providers used clinical judgment to screen for OSA on a case-by-case basis.
    - New or short-term sleep disturbances may be due solely to psychiatric disorders, situational stressors, medical complications, or other causes not related to OSA. If a provider determined the nature of the patient's sleep disturbance was likely linked to another cause, the STOP-Bang questionnaire was not completed.
    - Each individual provider had full discretion to not to screen for OSA.
    - Patients without sleep complaints were not screened for OSA and were not referred to sleep specialists.

- Checked in with providers and staff nurse weekly or as needed during the implementation period to assess barriers or needed improvements.
    - Collected field notes weekly to assess process of implementation.
    - When the DNP Project was showing signs of benefit, positively reinforced the use of the new screening and referral process through email or conversations.
    - Provided positive feedback to participating providers and staff nurses.

    - Requested information from nurse practitioners and psychiatrist about provider engagement and satisfaction with the protocol and screening tool.
    - Listened and was attentive to positive and negative aspects of the new referral process, as reported by the staff nurse completing referrals.
- Contacted each sleep specialist location approximately halfway through the implementation period to get feedback on referrals.
    - No complaints were provided by any office, and there were no indications that the local sleep specialist network was being unduly strained.

Evaluation.

- Monitored completed screenings.
    - Entered data into secure spreadsheets.
    - All spreadsheets were stored on an encrypted, password-protected computer at the DNP Project site. The computer was secured behind a series of multiple locked doors.
    - Screenings were evaluated and counted on a weekly basis.
- Monitored completed referrals using an ongoing tally of completed sleep specialist referrals throughout the implementation period.
    - Referrals were counted on a weekly basis.
- Created run charts for descriptive, quantitative data showing number of completed OSA screenings and completed sleep specialist referrals for each week of the implementation period.
- Completed descriptive summary of results including OSA screenings before and after the implementation period and sleep specialist referrals before and after the implementation period.

Aim 3: Make recommendations for scaling and sustainability based on results, focusing on screening as a permanently accessible part of the electronic chart and incorporating education on OSA in the organization's employee training.

Sustainability.

- Presented results and recommendations to administration and full organization during staff meeting.
    - Recommended permanent incorporation of screening tool for OSA into electronic health record for ongoing use.
    - Recommended inclusion of education on OSA screening during orientation period for newly hired providers or staff nurses.
- Considered implications for future work, including:
    - Evaluation to determine if patients followed through with sleep specialist referrals.
    - Evaluation to determine if use of the STOP-Bang questionnaire as a screening tool for OSA in this outpatient psychiatric patient population predicts the presence of OSA.
    - Evaluation to determine the impact of OSA treatment on psychiatric symptoms in this outpatient psychiatric patient population at 3-, 6-, 12-, or 24-month follow-up periods.

Scalability.

- Expand the screening and referral process to other outpatient sites within the organization.
- Expand the screening and referral process to the inpatient hospital site within the organization.

- Expand the screening and referral process to other regional organizations, both outpatient and inpatient.
- Present results via oral or poster presentation at a conference.
- Publish results in an academic journal.

DNP Project Timeline

Preliminary work including review of literature, assessment of providers' attitude toward OSA, and screening tool selection took place from December 2021 to June 2022. In May and June 2022, a protocol for screening and referring was completed, and the DNP Project was reviewed by the Yale IRB. In August 2022, the DNP Project was successfully defended. In October 2022, the DNP Project was approved by the IRB at the DNP Project site, and a final review of the current state of OSA screening and sleep specialist referral at the DNP Project site was completed. Beginning October 25, 2022, and ending December 31, 2022, completed screenings and referrals were completed and monitored. As-needed meetings with providers, staff nurses, and administration occurred during the implementation period to assess barriers or potential improvements.

Statement Related to Research on Human Subjects

As a quality improvement project, this DNP Project was found to be exempt from IRB approval by the Yale University IRB. A "not research" letter was issued by the Yale University IRB. A separate IRB governing the DNP Project site also found this DNP Project to be exempt. Spreadsheets of data did not include any type of identifying patient information.

Part 3

Systems Considerations and Implications

Leadership and Stakeholder Engagement

The DNP Project coordinator works as a Psychiatric Mental Health Nurse Practitioner at the outpatient psychiatric office that served as the DNP Project site. A protocol for OSA screening and sleep specialist referral in an outpatient psychiatric patient population was developed, and the DNP Project was approved by the director of outpatient services and the office manager of the DNP Project site. The external expert for the DNP Project was a psychiatrist who had worked at the DNP Project site for more than 6 years, and he was available to lend advice in how to best implement a quality improvement project in the context of the office's unique culture and milieu. Additional stakeholders included the nurse practitioners and psychiatrists completing medication management visits, staff nurses completing specialist referrals, and patients seeking mental health care. In selecting the screening tool, the principles of diversity, equity, and inclusion were considered, as the STOP-Bang questionnaire has been validated in diverse populations across six continents (Bernhardt et al., 2021; Chiu et al., 2017; Le Grande et al., 2021; Luo et al., 2014; Miller et al., 2018; Pivetta et al., 2021).

Business and Financial Considerations

In presumably all quality improvement projects, there is at least some tangible cost to the organization. By focusing on screening and referral as part of already scheduled medication management visits, this DNP Project had few costs before or during the implementation period. The final list of expenses totaled $842.85, coming in below estimations.

The physical materials to complete this DNP Project consisted only of printed copies of the STOP-Bang questionnaire and measuring tapes for assessing neck circumference. The cost of food for clinicians during the education sessions, while not necessary to reproduce this DNP Project, was another expense.

Although education and training were provided outside of paid work hours, in replicating this quality improvement project, costs of employee time for training would be approximately $335.50. Based on an estimated average hourly wage for nurse practitioners working at the DNP Project site of $48.00, training sessions of 30 to 45 minutes for four nurse practitioners would cost the organization approximately $120.00. Using a national average for psychiatrists' hourly wage of $117.00 (Salary.com, 2023b), a 30-minute training session for one psychiatrist would cost $58.50. Using a national average for licensed practical nurses' hourly wage of $25.00 (Salary.com, 2023a), a 60-minute training session would cost $25.00. The cost of the nurse practitioner trainer at $48.00 per hour for 2.75 hours of total training would be $132.00. If training was done in one or two sessions, costs could be reduced.

Initially, it was predicted the average screening time with the STOP-Bang questionnaire would be 4 minutes, meaning 143 screenings by nurse practitioners and 6 screenings by a psychiatrist would cost $504.40. The actual average screening time, however, was approximately 2.5 minutes, resulting in an actual cost of $315.25. It should be noted that these costs and times might be absorbed into the usual discussion of sleep disturbance during medication management visits.

During protocol development, the average time to complete a sleep specialist referral was estimated to be 5 minutes, and with 65 sleep specialist referrals completed, the cost would be $135.42. The actual referral time was on average 15 minutes due to the need for releases of information, faxing of referrals, and confirmation that referrals were received, resulting in a cost of $406.25 over the full implementation period.

The financial benefits for the site, providers, and patients are numerous, as the literature shows that psychiatric symptoms are significantly increased when individuals have both mental illness and OSA, resulting in greater healthcare costs through increased number of visits, unsuccessful medication trials, and more expensive interventions for treatment-resistant symptom constellations (Akashiba et al., 2022; Garbarino et al., 2020; Gupta & Simpson, 2015;

Knechtle et al., 2019). Outside of mental health, OSA has profound negative effects on virtually every organ system, driving up healthcare costs (Espiritu, 2021; Mirta et al., 2021). Metabolic syndrome, known for its high annual cost, is almost 15 times more likely among individuals with OSA, meaning identification of OSA could theoretically save billions nationwide (Boudreau et al., 2009; Kariuki et al., 2021; Nichols & Moler, 2011; Rohtagi et al., 2018).

Besides direct tabulation of costs, potential benefits in detecting OSA among psychiatric patient populations include resolution of psychiatric symptoms, leading to increased patient satisfaction and better outcomes. For staff and organizations, there are fewer healthcare visits focusing on sleep disturbance, meaning clinicians can focus more on purely psychiatric concerns and avoid the frustration of treatment-resistant sleep disturbance when traditionally prescribed hypnotics do not work, since the underlying cause is OSA.

On the other hand, there is some financial risk to the patient, as sleep specialist referrals could result in costs to the patient. The cost of sleep specialist visits and sleep studies vary widely based on individual providers' fees and patients' insurance coverage. The average cost of an office consultation with a sleep specialist is between $150 and $300 (Costhelper, n.d.). The average at-home sleep apnea test costs between $150 and $500, while the average overnight polysomnography test costs between $600 and $5,000, with a national average of $1,500 (Gilpin, 2022). Some individuals have no direct costs for these services, whereas others have substantial costs due to high co-pays or deductibles. Without knowing the results of completed sleep specialist referrals and how many patients were diagnosed with OSA, it is not possible to estimate the number of false positive screenings during this project, but multiple individuals could be unnecessarily referred given the STOP-Bang questionnaire's 27% to 37% specificity (Bernhardt et al., 2021).

Part 4

Results

Screening Results

Over a 10-week period beginning October 25, 2022, and ending December 31, 2022, 149 individuals with sleep complaints were screened for OSA using the STOP-Bang questionnaire. One hundred and three individuals (69.1%) scored 3 or higher, a positive screening, and 46 individuals (30.9%) scored 2 or lower, a negative screening. Among 149 screened individuals, the average score was 4, indicating moderate OSA risk. Among all positive screenings, the average score increased to 5, indicating high OSA risk. Table 1 displays the frequency of each STOP-Bang score. Based on score, 52 individuals (34.9%) were found to be at high risk for OSA, outranking the moderate risk group (n=51, 34.2%) and low risk group (n=46, 30.9%). Figure 1 shows identified risk of OSA, stratified by STOP-Bang score.

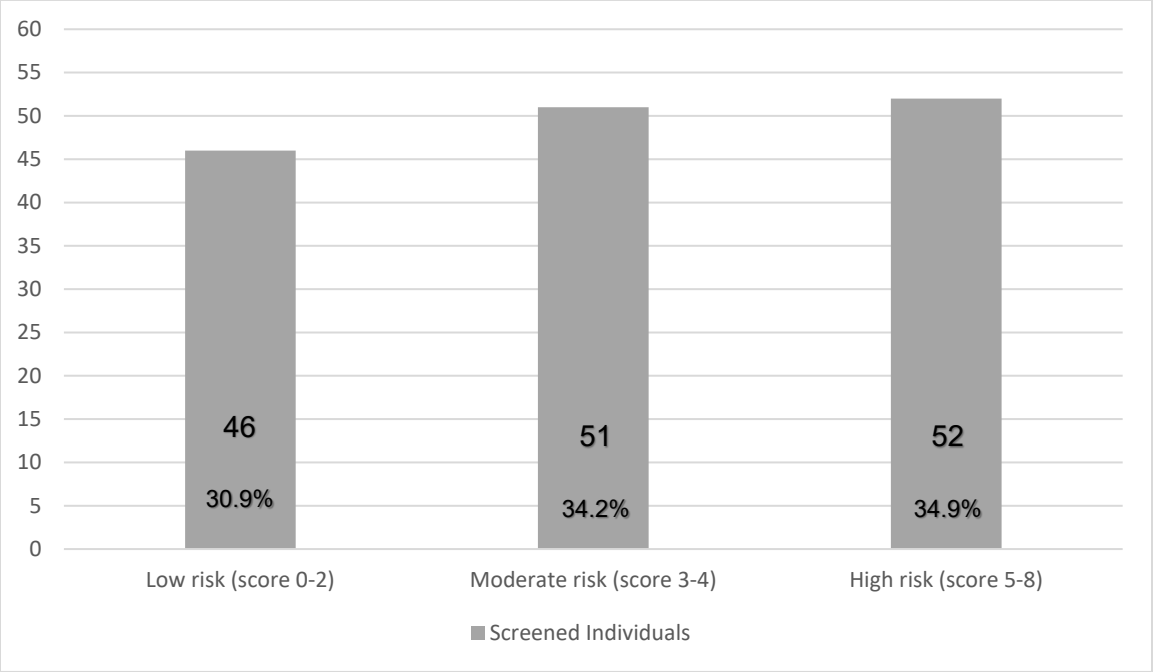
Table 1

Frequency of Each STOP-Bang Score (N = 149)

	DNP Project Cohort	
STOP-Bang Score	n	%
0	6	4.0%
1	15	10.1%
2	25	16.8%
3	23	15.4%
4	28	18.8%
5	34	22.8%
6	10	6.7%
7	7	4.7%
8	1	0.7%

Figure 1

Risk of OSA by STOP-Bang Score (N = 149)



Visit Types

Among completed screenings, 76 visits (51%) were conducted by telehealth using audio and visual equipment; 58 visits (39%) were conducted in-person at the DNP Project site; and 15 visits (10%) were conducted by telephone without visualization of the individual.

Endorsed STOP-Bang Criteria

Among the 8 items on the STOP-Bang questionnaire, the most common criterion endorsed was daytime tiredness or fatigue, with 124 individuals (83.2%) experiencing this symptom. Snoring loudly was also common, with 89 individuals (59.7%) endorsing this symptom. Among those who snored loudly, 57 individuals (64%) self-reported snoring; 16 individuals (18%) had a bedpartner who reported they snored; 8 individuals (9%) both self-reported snoring and had a bedpartner who reported they snored; and 8 individuals (9%) had missing data, as this part of the screening tool was not completed by the clinician. Table 2 shows the frequency of each STOP-Bang criterion.

Table 2

Percentage of Individuals Screening Positive on Each STOP-Bang Criterion (N = 149)

	DNP Project Cohort	
STOP-Bang Criterion	n	%
S (Snoring)	89	59.7%
T (Tiredness)	124	83.2%
O (Observed Apneas)	33	22.1%
P (Hypertension)	71	47.7%
B (BMI 35+)	54	36.2%
A (Age 50+)	49	32.9%
N (Neck Circumference 16+)	68	45.6%
G (Male Sex)	44	29.5%

Neck Circumference

In the full sample, 68 individuals (45.6%) were found to have a neck circumference greater than 16 inches. Thirty-six individuals (24.2%) did not have a neck circumference established due to the limitations of telehealth or telephone appointments. Final STOP-Bang scores could be higher in this sample if all neck circumferences had been measured.

Among positive screenings, 25 individuals (24.3%) were missing neck circumference, and among negative screenings, 11 individuals (23.9%) were missing neck circumference. In 5 cases, the STOP-Bang score was 2 but neck circumference was missing, meaning it was unclear if the individual would have scored 3 or higher (a positive screening) with a completed neck measurement. Table 3 shows how neck circumference was measured.

Table 3

Neck Circumference Measurement Method (N = 149)

	DNP Project Cohort	
Measurement Method	n	%
Observation by Clinician	46	31%
Measuring Tape by Clinician	44	30%
Missing Data Due to Telehealth/Telephone	36	24%
Not Addressed by Provider	11	7%
Shirt Size Reported by Patient	9	6%
Self-Measured by Patient at Home	3	2%

Sleep Specialist Referrals

Among the 103 positive screenings, 65 sleep specialist referrals were completed. Thirty-eight individuals (36.9%) who scored 3 or higher on the STOP-Bang questionnaire declined a sleep specialist referral or had no referral completed. The most common reason for a declined referral occurred among the uninsured patient population (n=10), who did not want to initiate services with a local no cost primary care provider whose network offers access to a sleep specialist. Multiple screened individuals either did not have available transportation to a sleep specialist (n=8) or had no interest in pursuing a referral (n=7). In 4 cases, a provider submitted a positive STOP-Bang screening but did not initiate a sleep specialist referral for unclear reasons. In 1 case, a referral was deferred because the screened individual was experiencing an episode of acute psychosis. Table 4 lists the reasons for declined, missing, or deferred referrals, as well as the mean STOP-Bang questionnaire score for each reason.

Table 4

Reasons Why Sleep Specialist Referral Not Completed After Positive Screening (N = 38)

	Declined, Missing, or Deferred Referrals		Mean STOP-Bang Score for Each Reason
Reason Referral Not Completed	n	%	
Refused No Cost PCP	10	26.3%	4
No Transportation	8	21.1%	5
Not Interested in Referral	7	18.4%	4
Clinician Did Not Initiate Referral	4	10.5%	5
Previously Seen by a Sleep Specialist	3	7.9%	5
Fear of a CPAP	2	5.3%	4
Child Care Issues	1	2.6%	3
Stress of the Holiday Season	1	2.6%	3
Lived Too Far Away from Any Specialist	1	2.6%	5
Referral Deferred Due to Psychosis	1	2.6%	4

Individual Provider Statistics

The DNP Project coordinator completed 102 of 149 screenings (69%). The four nurse practitioners and one psychiatrist participating in the implementation period completed the remaining 47 screenings. The DNP Project coordinator completed 36 of 65 referrals (55%). Three nurse practitioners and one psychiatrist participating in the implementation period completed the remaining 29 referrals. Among all screenings, four providers showed an average STOP-Bang score of 4; one provider showed an average STOP-Bang score of 5; and one provider showed an average STOP-Bang score of 1. Table 5 shows the number of screenings completed by each clinician and the number of sleep specialist referrals completed by each clinician.

Table 5

Completed STOP-Bang Screenings (N=149), Completed Sleep Specialist Referrals (N=65), and Mean STOP-Bang Score by Clinician

	Completed Screenings		Completed Referrals	
Screening Clinician	n	%	n	%
A (Project Coordinator)	102	69%	36	55%
B	3	2%	2	3%
C	6	4%	0	0%
D	2	1%	2	3%
E	30	20%	24	37%
F	6	4%	1	2%

Part 5

Discussion and Conclusion

Discussion of Results

Use of the DNP Project protocol showed that screening for OSA and referring to sleep specialists in psychiatric patient populations is feasible, efficient, and cost-effective in an outpatient mental health center. With 149 individuals successfully screened using the STOP-Bang questionnaire and 65 individuals successfully referred to sleep specialists, the results exceeded expectations. This protocol was effective in increasing the total number of OSA screenings and sleep specialist referrals: prior to the implementation period, there were no identified OSA screenings at the DNP Project site and only 2 sleep specialist referrals. While an overnight sleep study conducted and interpreted by a sleep specialist will be necessary to confirm a diagnosis of OSA, the STOP-Bang questionnaire's high sensitivity strongly suggests that many of the positively screened individuals in this sample are suffering from OSA without knowing it. Although initially there were concerns that local sleep specialists would be unable to absorb additional referrals from psychiatric providers, no individual referred to a sleep specialist was refused during the implementation period, confirming that sleep specialists readily accept referrals from providers working in mental health settings.

Results of this DNP Project are consistent with the literature findings that OSA is found in high rates among psychiatric patient populations (Gupta & Simpson, 2015). From 149 screened individuals, 103 individuals (69%) had a positive screening with the STOP-Bang questionnaire. The last quality improvement project in the literature screening outpatient psychiatric patient populations for OSA using the STOP-Bang questionnaire had similar results, with 69% of the 100 individuals having positive screenings (Alam et al., 2012). This percentage is higher than that found among the general population, as well as oncology, renal, cardiac, and preoperative patients (Chen et al., 2021; Hwang et al., 2021; Hwang et al., 2022; Jamwal et al., 2022; Subramanian et al., 2022).

In addition, nearly three-quarters of the sample (n=105, 71%) were biologically female. As male sex is an established risk factor for OSA, one might expect a cohort with a comparatively small number of biologically male individuals to see fewer positive screenings. Thus, the fact that 69% of this sample screened positive for moderate or high risk of OSA is striking. It is well-known that psychiatric patient populations usually include more females, so further study in this predominantly female patient population may provide valuable data for the literature on OSA.

Obstructive Sleep Apnea Risk and Severity

A remarkable finding from the results is that in this sample of outpatient psychiatric patients, the average STOP-Bang score was 4, which indicates moderate risk of OSA. When looking at only those individuals with a positive STOP-Bang questionnaire screening, the average score rises to approximately 5. This is noteworthy because with scores of 5 or higher, the sensitivity of the STOP-Bang questionnaire to detect any severity of OSA is 90% or greater, and the sensitivity to detect severe OSA is 95% (Bernhardt et al., 2021; Le Grande et al., 2021; Nagappa et al., 2015). Thus, not only did this sample have a high rate of positive screenings, but the scores suggest these individuals are at a greater risk for severe OSA if this sample performs as previously found in the literature.

Special Findings

Endorsement of Daytime Tiredness

Another notable finding from the results is that in this sample, 124 individuals (83.2%) reported excessive daytime tiredness, fatigue, or sleepiness. This was the most endorsed criterion of the STOP-Bang questionnaire by a large margin. Given that daytime tiredness is also a symptom of many psychiatric disorders such as major depressive disorder, bipolar disorder, and substance use disorder, there is ostensible concern that some of the individuals screening positive for daytime tiredness may have this symptom as part of their psychiatric

symptom constellation and not as part of OSA. Clearly, this could confound screening results in psychiatric settings.

Among the 23 individuals who had a STOP-Bang score of 3, 17 of those individuals (74%) reported daytime tiredness. Thus, in these 17 individuals, it is theoretically possible that daytime tiredness as part of a psychiatric disorder—and not OSA—tipped the scales and resulted in a positive screening on the STOP-Bang questionnaire. This may be a factor in the STOP-Bang questionnaire's low specificity. Further research may be needed on this phenomenon, as daytime tiredness may be overrepresented in psychiatric patient populations when compared to other patient populations. Nothing was found in the literature to suggest that the STOP-Bang questionnaire's sensitivity or specificity may be impaired by endorsement of daytime tiredness among psychiatric patient populations, but the findings in this DNP Project suggest that further investigation is warranted.

Measuring Neck Circumference

Conducting STOP-Bang questionnaire screenings through telehealth and telephone mediums presented a unique challenge in the acquisition of neck circumference. Given the large number of visits that took place through telehealth or telephone, it was unsurprising that there were 36 screenings (24%) when neck circumference simply could not be measured or estimated. To help assess neck circumference remotely, participating clinicians were trained to ask if telehealth or telephone patients knew their dress shirt size if they wore men's clothing or if they had the ability to measure their neck at home. Unfortunately, only 9 individuals were aware of their dress shirt size, which is likely related to the sample being 71% female. Less successful was self-measurement, as only 3 individuals had the means to measure their own neck circumference at home during a telehealth or telephone appointment.

As a final option, providers had the discretion to use visual inspection in deciding if an individual's neck circumference likely equaled or exceeded 16 inches. Thus, 46 individuals (31%) had neck circumference measurements assessed during telehealth encounters through

visual inspection. That so many individuals were assessed by observation alone introduces the risk of information bias to these findings. Observer bias from overestimating an individual's neck circumference could result in false positive screenings, while underestimating an individual's neck circumference could result in false negative screenings. In this sample, however, only 5 individuals had a positive score of 3 that included neck circumference of 16 inches or larger rated by visual inspection, meaning that an inaccurate visual observation could have produced a false positive screening in only a small number of encounters. By contrast, 3 individuals had a negative score of 2 that included neck circumference of 15 inches or smaller rated by visual inspection, meaning that an inaccurate visual observation could have resulted in a false negative screening.

While participating providers were instructed to rate neck circumference by observation only in cases where it ostensibly seemed irrefutable, as in the case of a patient with morbid obesity or a patient who is noticeably underweight, there was no way to verify that this always took place. Additionally, there are concerns about the heterogeneity of presentations using the telehealth medium: some video quality was quite clear, whereas other video quality was grainy, choppy, or pixelated. Furthermore, some assessed individuals sat very close to the camera, whereas others sat farther away. These factors could affect a clinician's ability to accurately estimate neck circumference by visual inspection using a telehealth medium. In the future, a helpful contribution to the literature might entail evaluation of how often clinicians are accurate in predicting a neck circumference of 16 inches or greater by visual inspection alone when using a telehealth medium.

Additionally, it is of note that some individuals outwardly seemed uncomfortable with having their neck circumference measured by a psychiatric provider with a measuring tape during a medication management appointment. While no individuals refused measurement, there were several encounters throughout the implementation period that unfortunately could be described as awkward. Specific qualitative data on these situations were not captured, but it is

theorized that insecurity about body shape or size, history of trauma or sexual abuse, or history of an eating disorder—among other things—could complicate an attention to neck circumference in psychiatric patient populations.

Provider Participation

Among the four nurse practitioners and one psychiatrist invited to participate in the DNP Project implementation period alongside the DNP Project coordinator, there was relatively low uptake of the STOP-Bang questionnaire. While one nurse practitioner completed 30 screenings and 24 referrals during the implementation period, the other invited providers participated only minimally. Eighty-nine percent of the STOP-Bang screenings and 92% of the completed sleep specialist referrals were completed by just two providers, including the DNP Project coordinator. One provider participating in the implementation period did not successfully complete any sleep specialist referrals, though it is of note that this provider, with a mean score of 1, had the lowest average of STOP-Bang scores among all providers.

It is unknown why 4 of the 6 participating providers had comparatively low rates of STOP-Bang screenings and sleep specialist referrals. The education and training sessions may have been too casual in nature, structured more as conversations and less as the formal launch of an important new protocol. It is possible that as a quality improvement project, this DNP Project did not garner as much interest as a randomized controlled trial. While provider interest seemed substantial during the early stages of Kotter's 8-Step Process for Leading Change, this did not translate to high participation rates during the implementation period. With future scholarship endeavors, strengthening the education and training sessions and focusing on better methods to secure provider interest would likely improve results.

Declined, Missing, or Deferred Sleep Specialist Referrals

Among the 103 individuals with positive STOP-Bang questionnaire screenings, 38 individuals (37%) were not referred to a sleep specialist. That more than one-third of individuals with a positive screening did not receive a sleep specialist referral was an unexpected finding.

Thirty-three individuals declined a sleep specialist referral for various reasons. The reason for an incomplete sleep specialist referral remains unknown in 4 circumstances. In only 1 situation was a sleep specialist referral deferred and never completed, and this was due to the individual experiencing acute psychotic symptoms and not returning to the office during the implementation period. Considering that 16 of these individuals (42%) had an average STOP-Bang score of 5, indicating high risk for OSA, it may be important to look for ways to increase interest in sleep specialist referral among those who decline to be referred.

The greatest number of individuals who declined referrals were uninsured or unhoused. The DNP Project site sees individuals of all socioeconomic backgrounds, and a significant number of screened individuals were identified as uninsured or unhoused. The uninsured individuals who declined a referral usually did so because they did not want to start primary care services at a no cost healthcare center for the uninsured that offers sleep specialist services. The unhoused individuals who declined a referral often had no means of transportation to available sleep specialists or simply were not interested given the competing demands of navigating the situational and environmental stressors of staying in the local shelter. While the DNP Project coordinator communicated with the local shelter to ensure that guests would have the ability to use CPAP equipment should they proceed with sleep specialist evaluation and treatment, it is understandable that many unhoused individuals did not want to deal with special sleeping arrangements at the shelter or the daytime storing of equipment. Thus, in outpatient psychiatric patient populations—or any patient population with uninsured or unhoused individuals—successful completion of a sleep specialist referral may be a recurring obstacle.

Sustainability

Overall, the protocol of OSA screening and sleep specialist referral used in this DNP Project appears sustainable and could be instituted as a permanent process within the DNP Project site's organization. To enhance sustainability, the STOP-Bang questionnaire could be incorporated as a fixed item in the organization's electronic medical record, allowing providers to

use it for OSA screening while delivering routine mental health care. Alternatively, if incorporation into the electronic medical record is not feasible, ongoing use of the paper form of the STOP-Bang questionnaire remains a viable option. Including information on the protocol of OSA screening and sleep specialist referral in standard employee training for new hires can better ensure future employees are aware of the protocol's existence and utility.

Outside of measuring neck circumference during telehealth or telephone appointments, no significant barriers were identified in using the STOP-Bang questionnaire to screen for OSA in psychiatric patient populations. To circumvent this barrier in future projects or scholarship, it may be possible to make slight adjustments to screening practices during telehealth or telephone appointments by employing a different screening tool in these cases. The STOP questionnaire, which is the precursor of the STOP-Bang questionnaire, could be used during telehealth or telephone encounters (Chung et al., 2008). There is limited evidence in the literature for use of the STOP-Bag questionnaire, which is a modified version of the STOP-Bang questionnaire that removes the neck circumference criterion (Boulos et al., 2019; Katzan et al., 2016; Strange et al., 2021). While it must be noted again that neck circumference is the only criterion on the questionnaire that has independent associations with an ultimate diagnosis of OSA (Morinigo et al., 2022), it could be possible to use the full STOP-Bang questionnaire only during in-person appointments, with the STOP-Bag questionnaire utilized only during telehealth or telephone appointments. Lastly, an additional option is a new instrument for OSA screening called the GOAL questionnaire, which has been receiving recent attention in the literature and does not require measurement of neck circumference (Duarte et al., 2020a; Duarte et al., 2022b; Duarte et al., 2022; Zhao et al., 2022; Zheng et al., 2022). Studies from the past 2 years show the GOAL questionnaire may have sensitivity above 90% in certain populations and may be non-inferior to the STOP-Bang questionnaire among patient populations referred for a sleep study (Duarte et al., 2021; Zheng et al., 2022).

The sleep specialist referral process also appears sustainable. Though there were initially concerns that a high volume of referrals might overwhelm the local sleep specialist network, this did not turn out to be the case. In fact, because several of the sleep specialists on the prepared list so readily took referrals, it was not necessary to use every sleep specialist included on the created list. The majority of referrals went to just three locations, and they reported no concerns or issues with the number of completed referrals. A potential improvement to this protocol would be a longer implementation period that allowed for longitudinal follow-up, evaluating which individuals went on to meet with sleep specialists and which individuals ultimately received a confirmed diagnosis of OSA.

There are important limitations to note regarding this DNP Project. As a quality improvement project at a single site, generalizability is an issue: this data cannot represent all psychiatric patient populations. Additional work would be needed to see if this protocol is effective for other distinct psychiatric populations, such as the inpatient setting. Also, during the implementation period, specific patient-identifying information was not collected. In the future, additional demographic data may be valuable in better distinguishing which individuals among psychiatric patient populations are more or less likely to have positive OSA screenings.

Another limitation is a lack of qualitative data regarding provider satisfaction with the protocol or the STOP-Bang questionnaire: participating clinicians gave either little or no feedback to the DNP Project coordinator during or after the implementation period. It remains unknown why some participating clinicians used the protocol so few times. Better collection of provider feedback on provider satisfaction, feasibility, and utilization by survey could increase chances of sustainability.

Scalability

Recommendations for scalability include expansion of the screening and referral protocol to all providers at the DNP Project site. Improving uptake is key in the success of the protocol, so one focus of scalability would be developing improved education and training

sessions for all providers; another focus would be securing qualitative data regarding low uptake among some providers. One possible adaptation to the protocol would be to see if nurses completing the intake process on all new patients could perform the STOP-Bang questionnaire and pass it along to the nurse practitioners and psychiatrists completing medication management appointments. With this adjustment to the protocol, all new individuals presenting to the outpatient office would be screened for OSA, and providers could then decide to complete further assessment or refer to a sleep specialist based on the results.

Following improved uptake and demonstration that all providers can successfully use the protocol, the next recommendation for scalability would include expansion to other outpatient sites within the organization. While sleep specialists in the areas local to the other outpatient sites will need to be identified, the core screening and referral process should not need adaptation for new sites. Eventually, depending on clinician interest, the screening and referral protocol could be implemented at the inpatient hospital within the organization, as well. The screening and referral protocol is easily transferrable to many other psychiatric and mental health settings, meaning it could be adopted by other organizations in the region and nationwide that are not part of the DNP Project site's host organization.

Future quality improvement projects or other scholarship opportunities stemming from this DNP Project may include evaluation to determine if patients followed through with sleep specialist referrals; validation of the sensitivity and specificity of the STOP-Bang questionnaire as a screening tool for OSA in psychiatric patient populations; and evaluation of the impact of OSA treatment on psychiatric symptoms.

Dissemination

Results of the DNP Project were disseminated via poster presentation at the Yale School of Nursing Scholar's Day on April 21, 2023. An abstract for presentation of results was submitted and accepted for the upcoming American Psychiatric Nurses Association (APNA) conference in October 2023, to be held in Orlando, Florida. Results were presented to the

administration and staff of the DNP Project site in April 2023. Finally, publication of results and recommendations in an academic journal will be pursued. Journals for potential submission include Journal of the American Psychiatric Nurses Association, Issues in Mental Health Nursing, Perspectives in Psychiatric Care, Journal of Psychiatric and Mental Health Nursing, Archives of Psychiatric Nursing, and International Journal of Mental Health Nursing.

Conclusion

Obstructive sleep apnea is a common disease that causes or worsens many mental and physical health comorbidities and is well-known to reduce overall quality of life. It is highly prevalent among psychiatric patient populations, where detection of OSA is crucial to avoid potential misdiagnosis of psychiatric illnesses such as depression and unnecessary use of psychiatric medications. By accurately identifying OSA, psychiatric symptoms may be improved, and the risk of suicide may be decreased. The OSA screening and sleep specialist referral protocol developed for this DNP Project gives clinicians an option to better detect undiagnosed OSA and refer to the appropriate healthcare specialists for treatment. Over a roughly 10-week period, this DNP Project demonstrated the viability of a screening and referral protocol, screening 149 individuals for OSA and successfully referring 65 individuals to sleep specialists. The most common outcome in this outpatient psychiatric population was a screening score indicating moderate risk for OSA, and among those with a positive screening, the most common outcome was a score indicating high risk for OSA. Improvements to this DNP Project include longitudinal follow-up on completed referrals and diagnosis of OSA, as well as better collection of qualitative data regarding provider participation and satisfaction. Future scaling will include expansion of the protocol to all providers and all patients at the outpatient site, and if successful, ultimate expansion to multiple outpatient and inpatient sites. Dissemination of the results will include conference presentations and article publication.

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Appendix A

Full Search Data

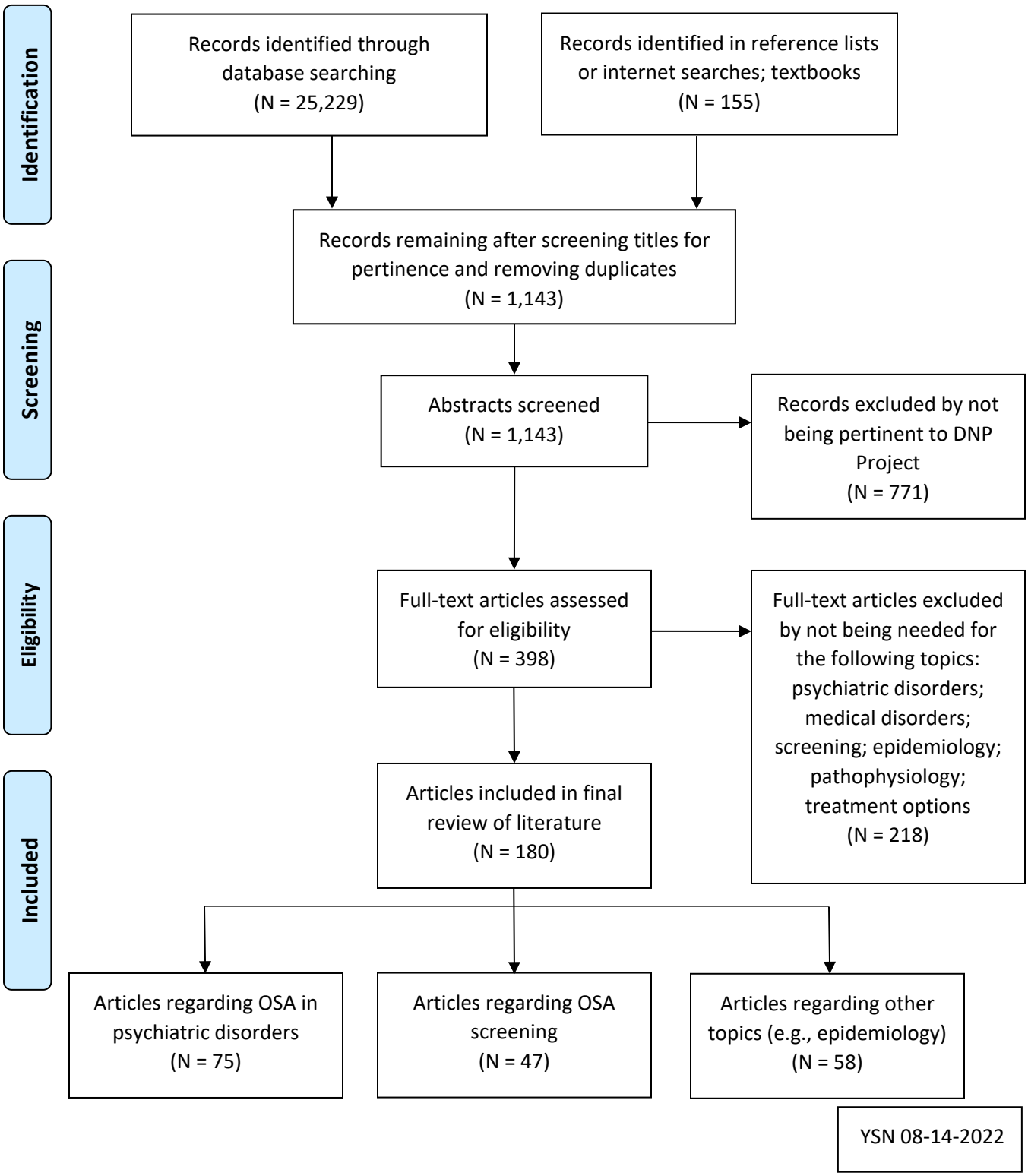
Table A1

Database Search Commands with Date Ranges and Total Number of Discovered Articles

Database	Primary search command	Additional search term	Date range	Article total
PubMed (1st search)	(sleep) AND ((apnea) OR (apnoea)) AND	(psych*)	2011-2021	3,800
		(menta*)		940
		(neuropsy*)		570
		(depres*)		1,588
		(bipol*)		99
		(schiz*)		145
		(metabol*)		4,525
		(suicid*[Title])		12
		(epidemiol*[Title])		114
		(patho*[Title])		293
		(metabol*[Title])		549
		(cardiometabol*[Title])		70
		(cardiovas*[Title])		768
		(diabet*[Title])		581
		(cance*[Title])		170
		(mortal*[Title])		199
		(screen*[Title])		682
		(STOP-Bang[Title])		168
		(NoSAS[Title])		19
		(partn*[Title])		23
		(CPAP[Title])		943
		(psychothera*)		81
		(insomni*[Title])		306
		(risk*[Title])		1,670
		((systematic) OR (meta-ana*))		2,845
PubMed (2nd search)	(sleep) AND ((apnea) OR (apnoea)) AND	(psych*)	2022	61
		(menta*)		28
		(neuropsy*)		12
		(depres*)		35
		(bipol*)		3
		(schiz*)		2
		(metabol*[Title])		12
		(suicid*[Title])		2
		((systematic) OR (meta-ana*))		81
Ovid Medline	Exp Sleep Apnea Syndromes/ and .	"psych*".m_titl.	2011-2021	184
		"menta*".m_titl.		48
		"neuropsy*".m_titl.		68
		screen*".m_titl.		707
		STOP-Bang.m_titl.		140
		systematic.m_titl. and "meta-ana*".m_titl.		319
Scopus	(sleep) AND (apnea) AND	TITLE (psych*))	2011-2021	217
		TITLE (menta*))		36
		TITLE (neuropsy*))		41
		TITLE (stop-bang))		149
		TITLE (screen*))		766
		TITLE (systematic) OR TITLE (meta-ana*))		1,106
Cochrane Library	apnea	*N/A*	2011-2021	24

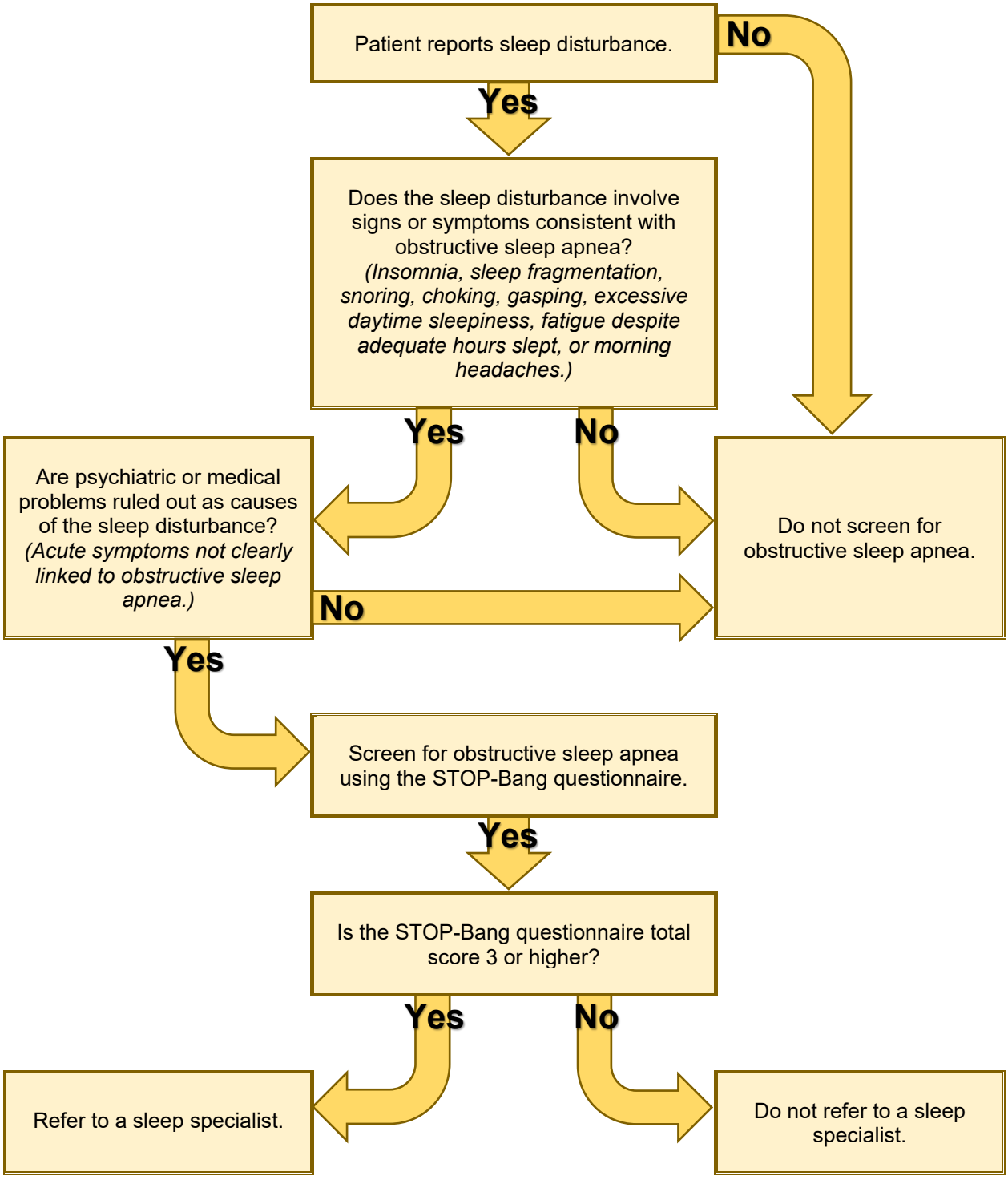
Appendix B

PRISMA Flow Chart



Appendix C

DNP Project Decision Tree



Appendix D

SWOT Analysis

Internal

Strengths	Weaknesses
➢ Engaged leadership ➢ Staff nurse already on-site doing specialty referrals ➢ Large patient base	➢ Providers do not view OSA as a psychiatric concern ➢ Lack of knowledge about OSA among providers ➢ Previous resistance to nurse-driven innovation
Opportunities	**Threats**
➢ Experts currently call for increasing screening of OSA among psychiatric populations ➢ Local area has many sleep specialists ➢ Possibility of being the area's first center to integrate OSA and psychiatric care ➢ Could add to organization's reputation as a benefactor ➢ Could generate national interest for widespread use	➢ Local sleep specialist network could be overwhelmed ➢ No national climate to screen or refer for OSA ➢ No increased reimbursement for psychiatric providers ➢ Co-pays and equipment costs associated with OSA treatment could be difficult to navigate

External