Increasing Compliance to Antidepressant Medication Regimens in Adults Diagnosed with Depression Through Education of Psychiatric Mental Healthcare Providers on the Use of Medication Reminder Smartphone Apps

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In partial fulfillment of the requirements for the Doctor of Nursing Practice

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June 14, 2024

Acknowledgement

I thank the Almighty God for His grace and for making this project a success and bringing it to completion. I appreciate my project instructor Dr. Samantha Peckham for her support, guidance, and patience. I also appreciate my project mentor, Dr. Khadija Hamisi for her guidance and encouragement.

I am thankful to God for my family for their love and support. I thank my friends and well-wishers for their encouragement.

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Abstract

The problem of antidepressant medication nonadherence is rampant among many adults with antidepressant prescriptions. However, the American Psychological Association's guidelines highlight that providers have a role in supporting patients in remaining adherent. Therefore, the project's purpose was to educate mental healthcare providers on medication reminder smartphone apps to improve antidepressant medication adherence among adults taking antidepressants. The setting was an outpatient office and a psychiatric mental healthcare facility. A quality improvement design was used to guide the educational intervention for the healthcare providers. Participants were providers working with patients with depression, and data collection was through pre- and post-knowledge surveys, HBMAS questionnaires, and a chart audit. Results showed an improvement in knowledge of antidepressant adherence and medication reminder applications from 68.20 (SD = 4.144) to 96.00 (SD = 2.299), improvement in antidepressant adherence ($p < .001$), and compliance with assisting patients to adhere to antidepressant ($p = .016$). The outcomes support that the intervention will promote better antidepressant adherence and patient-provider collaboration to promote depression management. The project outcomes may promote the adoption of medication reminder smartphone apps to facilitate the adoption of mobile technologies to improve antidepressant medication adherence. The project outcomes may guide the development of policies impacting depression management, including integrating modern technologies, such as smartphone reminder apps, to promote treatment adherence.

Keywords: Antidepressants, nonadherence, medication smartphone apps, medication compliance, and mental healthcare providers.

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Section 1

Antidepressant medication nonadherence is a critical problem bedeviling mental healthcare for patients with depression. Using a medication possession ratio of below 80% to describe nonadherence, Pedrosa-Naudin et al. (2022) revealed that nonadherence to antidepressants was common in a fifth of the individuals with antidepressant prescriptions. Similarly, Dell'Osso et al. (2020) revealed that about 25% of patients with antidepressant prescriptions discontinue their medication within a month. Ta et al. (2021) reported higher outcomes, citing that only 35% to 55% of patients with antidepressants are adherent to the medications at six months. Semahegn et al. (2020) also revealed that adherence to antidepressants is about 65%. Overall, the above studies show a backdrop in antidepressant adherence among patients with depression, which calls for interventions towards increasing medication adherence.

The problem of antidepressant medication nonadherence also emerged as a thorny issue within the practice site for the EBP project. The healthcare team working at the facility includes a psychiatrist, two nurse practitioners, and three registered nurses. The above healthcare providers reported that the standard practice for patients with depression involves prescribing antidepressants for six to eight weeks, followed by a maintenance phase of four to six months. Patients also receive initial advice on taking the prescribed medication regimen; however, no proactive interventions are currently in place to sustain patient adherence over time. In the past three months, nearly 100 people with depression received healthcare at the facility. Among the above patients, only 40 demonstrated consistent adherence to antidepressant treatment and

adhered to scheduled treatment appointments.

Stakeholders within the facility concurred that approximately 50% of patients under antidepressant prescriptions become non-adherent within two months of initiating treatment, as revealed by the disparity in medication pill counts and missed refills. The gravity of the situation is further underscored by the incidents of two patients who, having previously discontinued antidepressant treatment, committed suicide in the past year. The recurring problem of nonadherence has persisted over time, yet the healthcare practitioners employed at the facility have not implemented any targeted interventions to address the issue. Another notable concern is the prevailing perspective of most of the healthcare providers at the facility who ascribe the responsibility for maintaining adherence to antidepressant regimens to patients, an outcome reported in some findings (Kleinsinger, 2018). Against the above shortfalls, the American Psychological Association ([APA], 2019) provides general guidelines on treatment adherence that may guide mental healthcare providers in depression management.

The APA guidelines note that best practices and therapies cannot benefit a patient if the patient cannot adhere to treatment due to several barriers. Notably, several factors exist that make full adherence to a treatment challenging. Therefore, healthcare providers must rely on sound clinical judgments to know when to deviate from the protocol or stop a specific treatment if it is not working. Also, current data do not provide support for one treatment over another. Thus, healthcare providers could support patients in educational and decision-making capacities to promote patient compliance with treatment and success (APA, 2019). After considering the facility process, the best practice would be for healthcare providers working there to support patients on antidepressant medication to remain adherent. However, there is a gap in failing to support patients to become adherent to depression treatment, an outcome that is perceived as the

patient's sole responsibility.

Potential barriers to addressing the problem within the project site included a lack of knowledge of available interventions to assist patients on antidepressant prescriptions to remain adherent. The healthcare providers could also be unaware of the challenges leading to nonadherence, thus impacting the implementation of measures to address the problem. Despite the challenges, studies support that consistent medication intake is crucial in depression management (González de León et al., 2022; Low et al., 2021). Therefore, healthcare providers working at the facility should support patients in achieving over 90% adherence rate to antidepressant medication. An intervention that could help address the problem is educating the healthcare providers on prescribing medication reminder smartphone app interventions as supportive interventions for patients with depression. Smartphone reminder app interventions contribute to statistically significant improvements in antidepressant adherence and reductions in discontinuation rates (Teeng et al., 2021; Pérez-Jover et al., 2019; Raveouri et al., 2021). The apps could also promote tracking and self-monitoring of medication intake (Armitage et al., 2020; Patoz et al., 2021). Therefore, the apps could support non-adherent patients who often forget to take their medications or encounter patient-related causes of nonadherence, including inappropriate intake of antidepressants or carelessness (Marasine & Sankhi, 2021).

Problem Statement

Depression treatment using antidepressant medications is crucial and impactful, yet suboptimal medication compliance remains a pressing problem (Baeza-Velasco et al., 2019). Such a challenge underscores the nuanced interplay between patients' compliance to treatment and treatment efficacy, thus bringing to light the critical role of mental healthcare providers in improving patient medication adherence and optimizing treatment outcomes (Solmi et al., 2022).

If no interventions are implemented to help patients with depression remain adherent, patients with depression could experience worse outcomes, including poor psycho-social outcomes, worsening symptoms and comorbidities, and wastage of healthcare resources due to recurrent rehospitalizations or depression relapse (Dhungana et al., 2023; Semahegn et al., 2020). Notably, non-adherent patients to antidepressants incur higher medication, inpatient, and emergency costs than adherent patients (Ta et al., 2021). Therefore, as the discourse around mental healthcare adopts the use of patient-centered interventions, a collaborative approach involving primary mental healthcare providers as patient advocates for improved adherence could facilitate the application of EBP interventions underpinned by empirical evidence and current clinical guidelines, which are crucial yardsticks of best practice in mental healthcare (Hollon, 2019). Thus, educating healthcare providers on how to support patients on antidepressants by using medication reminder smartphone apps could contribute to improved antidepressant adherence, leading to an improvement in depression outcomes.

Project Question

A project question was developed using the population, intervention, comparator, outcome, and time (PICOT) framework to guide the EBP project. The question stated, "Among psychiatric mental healthcare providers (P), does implementing an educational intervention on medication adherence using smartphone apps (I) compared to usual care (C) improve compliance with the intervention and improve medication adherence in patients taking antidepressants (O)?"

Section 2

Search Methods

A literature review explored current evidence on the use of medication reminder smartphone apps to improve antidepressant medication adherence among patients with depression. The databases included Educational Resources Information Center (ERIC), PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and SagePub. The above databases contain healthcare-related research articles that are appropriate for addressing the PICO question guiding the project. Keywords such as improving, antidepressant medication compliance, depression, medication reminder smartphone apps, and mental healthcare providers were used. The keywords were combined using operators to form search phrases to facilitate a focused literature review. The search phrases included improving AND antidepressant medication compliance AND, depression AND medication reminder smartphone apps, AND mental healthcare providers.

Several limiters were implemented during the literature search in the databases. For instance, the retrieved articles were studies published between 2018 and 2023. The limiters ensured the use of current research articles on medication reminder smartphone apps. Following the literature search process, duplicates were removed. Inclusion and exclusion criteria were used on the retrieved studies to ensure the currency and relevance of the studies. The inclusion criteria were peer-reviewed research articles published between 2018 and 2022 relevant to the research problem. Exclusion criteria were implemented to ensure high-quality research evidence was included in the literature review. Notably, editorials and commentaries were excluded from the literature review. Overall, 96 articles were available for review from the four databases, but only eleven were utilized in this review due to having the most robust evidence on the PICO question.

Review of the Study Methods

Several methodologies were employed in the eleven studies included in the literature review. For instance, Pratiwi et al. (2023), Pérez-Jover et al. (2019), and Steinkamp et al. (2019) were systematic reviews. González de León et al. (2022) was a meta-analysis on effective interventions for improving medication compliance. Low et al. (2021), Raevuori et al. (2021), and Teeng et al. (2021) were randomized control trial studies used in the review. The literature review included one qualitative study and two integrative reviews (Backes et al., 2021; Solmi et al., 2021; Patoz et al., 2021). The literature review also included a national guideline (APA, 2019).

Review Synthesis

Nonadherence to antidepressant medications is detrimental as it can cause psycho-social outcomes, worsen symptoms and morbidities, and increase healthcare spending owing to recurrent institutionalizations or depression relapse (Dhungana et al., 2023; Semahegn et al., 2020). Thus, healthcare providers must adhere to existing national guidelines by implementing interventions to assist patients with depression to improve their compliance with antidepressants. The available evidence does not endorse a particular medication adherence intervention (APA, 2019).

Consequently, healthcare providers could assist clients by offering educational assistance and supportive interventions to advance patient medication compliance (Somi et al., 2022). Within such a scope, informing medical professionals about an innovative intervention, such as prescribing reminder mobile applications as supplemental interventions for those suffering from depression, is essential. Medication reminder application interventions have produced notable improvements in antidepressant compliance and declines in termination rates (Low et al., 2021; Pérez-Jover et al., 2019; Teeng et al., 2021).

The applications could also promote diligent monitoring and self-regulation of medication

intake (Armitage et al., 2020). The convenience of having medication-reminder applications at their fingertips can significantly benefit patients, especially those with busy lifestyles or chronic diseases requiring complex medication regimens (Peng et al., 2020). Thus, the apps could support patients who struggle with adherence, such as individuals prone to forgetting to take medication or encountering patient-related factors contributing to noncompliance, such as improper antidepressant usage or neglect (Solmi et al., 2020). While mobile applications are a valuable tool, healthcare providers remain indispensable in improving medication adherence. Healthcare providers are crucial in educating patients about the importance of adhering to their prescribed antidepressant regimen (Solmi et al., 2020). A collaborative strategy involving frontline mental healthcare providers acting as advocates for enhanced adherence may facilitate the implementation of evidence-based interventions rooted in research findings to address nonadherence to antidepressant medication.

Theme Development

Compliance with medication administration is a fundamental factor in providing successful depression intervention. The reviewed studies revealed significant evidence of antidepressant medication nonadherence and how healthcare providers can use interventions such as medication reminder smartphone apps to support patients with antidepressant medications to remain adherent.

Theme 1: Antidepressant Medication Nonadherence

Antidepressants are a crucial treatment intervention for depression, yet suboptimal treatment compliance remains a prevailing challenge (Solmi et al., 2020). Around 50% of patients placed on antidepressant prescriptions become non-compliant within two months of starting treatment (González de León et al., 2022). In another study, 13-52% of individuals with

antidepressant prescriptions fail to adhere to their medications (Steinkamp et al., 2019). Such gaps necessitate critical interventions to aid the individuals in staying adherent, which requires understanding the challenges impeding antidepressant medication compliance (Pérez-Jover et al., 2019). Patoz et al. (2021) also highlighted that nearly half of the patients with depression remain untreated. Therefore, the above studies reveal a high burden of nonadherence and sub-optimal treatment of depression among patients with antidepressant prescriptions.

Antidepressant nonadherence spells a bleak prospect for patients with depression. For instance, nonadherence may contribute to poor depression prognosis and ballooning healthcare costs for affected individuals and the healthcare system (Low et al., 2021). Pérez-Jover et al. (2019) added that sub-optimal use of prescribed antidepressants and the resultant suboptimal levels of depression treatment may contribute to prescription or dosage changes that may result in more potent medications leading to significant side effects or dependence. Therefore, healthcare providers must be alert to the obstacles correlated with noncompliance to introduce interventions to address the pressing problem (Solmi et al., 2020). For instance, multiple factors can result in nonadherence, such as forgetfulness, negative patient beliefs in medication efficacy, increased medication costs, and carelessness (Solmi et al., 2020). Alternatively, patients with antidepressant prescriptions may also demonstrate intentional or non-intentional antidepressant nonadherence (Steinkamp et al., 2019). Forgetfulness occurs as a significant concern hindering many patients from becoming adherent to antidepressant medications (Pérez-Jover et al., 2019; Steinkamp et al., 2019). Without such understanding, it will be tough to address antidepressant nonadherence and aid patients with adherence problems in experiencing a reduction in depression symptoms due to compliance with antidepressant medication.

Theme 2: Best Practice for Medication Adherence

A recent update of the APA highlighted the onus of healthcare providers in addressing medication nonadherence among patients receiving treatment for depression (APA, 2019). The APA (2019) supports antidepressant medications as a best-practice intervention for depression treatment. As such, adherence to antidepressants is a crucial aspect of depression management. The APA also noted that such best-practice interventions cannot benefit patients in case of nonadherence. Therefore, healthcare providers must play a crucial role in supporting patients with depression to remain adherent to antidepressants (APA, 2019). Such support interventions may include educational interventions to facilitate patients' compliance with treatment. Congruent with such needs for best practice, interventions have been developed to promote patient medication adherence. For instance, González de León et al. (2022) supported the use of mobile technologies, web-based emails, and telephone reminders as innovative interventions for improving medication adherence. Pratiwi et al. (2023) also reported using technological interventions, including medication reminder applications, to improve medication adherence. The above patient technologies reveal an expansion in digital patient technologies for improving health. For instance, over 10, 000 mental health smartphone applications are available online (Patoz et al., 2021).

Several studies have also supported the growing support for mobile health interventions in promoting patient health and medication compliance (Raveouri et al., 2021; Patoz et al., 2021; Pratiwi et al., 2023). Patoz et al. (2021) also highlighted positive perspectives on using smartphone app interventions in managing depression. The study explored patient and physician perspectives, highlighting significant support for smartphone applications in improving depression management (Patoz et al., 2021). The smartphone applications could guide patients in taking medication as prescribed and functionalities to assist patients in navigating daily life (Patoz

et al., 2021). Backes et al. (2021) revealed the significant potential of medication reminder smartphone apps but also cautioned on their use. Backes et al. (2021) highlighted that the apps could give reminder notifications, have high acceptability, and help the mental healthcare provider tailor the patient treatment regimen to support patient adherence. However, the above study cautioned about concerns about security and data protection (Backes et al., 2021). Overall, health interventions, including medication reminder smartphone apps, represent a novel yet promising intervention that can be applied within clinical settings to promote antidepressant medication adherence among patients with antidepressant prescriptions.

Theme Three: Effectiveness of Medication Reminder Smartphone apps

Several studies support the efficacy of medication reminder smartphone applications. Patoz et al. (2021) highlighted that patients revealed that smartphone medication reminder apps could improve self-monitoring of medication intake, while physicians' perspectives regarding smartphone apps are that the apps should promote patient adherence to medication. Pérez-Jover et al. (2019) revealed that medication-reminder smartphone apps improved medication adherence significantly in patients who were non-adherent to medication ($p < .05$). The average improvement in medication adherence following the use of medication-reminder smartphone apps was between 7% and 40% (Pérez-Jover et al., 2019). In Raevuori et al. (2021), an eight-week smartphone app intervention that supplemented treatment as usual improved antidepressant use among patients in the treatment group than in the control group ($d = -0.73$, $p = 0.01$). Similar outcomes were noted in the study by Low et al. (2021), whereby two months of medication reminder smartphone app usage led to an improvement in medication adherence in the interventional group ($p < .001$).

Teeng et al. (2021) noted that there was an improvement in the interventional group

attendance to regular follow-ups (76.8% vs. 56.4%) and medication adherence (Mean difference = 23.1) in the interventional group using a medication reminder smartphone app than in the controls (p <.001). Teeng et al. (2021) showed a significant improvement in depression outcomes in the interventional group than the control group (p < .025). Gonzales de Leon et al. (2022) also highlighted that medication reminders delivered through smartphone applications were an innovative and impactful intervention that could improve medication adherence among patients taking prescription medications such as antidepressants. Overall, using medication reminder smartphone apps has been supported by various studies as an impactful intervention for improving medication adherence, and it could be used to improve antidepressant medication adherence in people with depression.

Quality Gap and Contextual Information

By gleaning on the above evidence in the reviewed literature, there is significant support for using smartphone applications to aid patients taking antidepressants to remain adherent to the medications. While such evidence is crucial, it highlights a glaring quality gap within the project site involving minimal interventions for promoting antidepressant medication adherence. Notably, healthcare providers fail to implement innovative reminder interventions such as smartphone apps, which are well supported in current evidence-based research, contributing to low integration in clinical practice and reduced use of the apps among patients (Patoz et al., 2021). Additionally, patient non-attendance to the facility for regular follow-ups and medication refills highlights a significant gap in helping patients receive optimal mental healthcare and realize optimal treatment goals to facilitate a reduction or complete remission from depression. With forgetfulness emerging as a substantial impediment to full antidepressant compliance, it is crucial for the healthcare providers working at the project site to adopt interventions to address nonadherence to

antidepressants (Pérez-Jover et al., 2019; Steinkamp et al., 2019),

Within such a context, González de León et al. (2022) conducted a comprehensive review concluding that regular antidepressant usage is imperative to treating depression, and healthcare providers working with patients with depression need to support patients to achieve adherence rates of more than 90%. Therefore, implementing a reminder system within the project site to assist patients with depression in remaining adherent would facilitate the adoption of best practices and improve patient and facility outcomes. Such a system could involve educating healthcare providers working at the project site on medication reminder smartphone apps and incorporating the intervention as a routine for all patients with antidepressant prescriptions.

Conclusion

Overall, medication reminders through smartphone apps emerge as a crucial supportive intervention for patients taking antidepressant medication. Teeng et al. (2021) highlighted that medication reminder smartphone apps are feasible and generally accepted within psychiatric settings. Therefore, educating healthcare providers working with patients with depression on the utilization of such apps and the foreseeable benefits of the intervention in improving compliance to antidepressants and the associated outcomes, such as a reduction in depression symptoms and reductions in discontinuations, could contribute to the adoption of the intervention within the project site. Utilizing medication reminder smartphone apps could also promote the use of patient technologies to reduce the burden of depression in society and improve individual mental wellness.

Section 3

Aims and Objectives

The project aimed to address a gap in practice involving mental healthcare providers failing to support patients with depression to become adherent to depression treatment. Medication reminder smartphone apps can improve adherence to antidepressants in patients with depression and could be a viable intervention to support patients in remaining adherent (Perez-Jover et al., 2019; Raveouri et al., 2021). Therefore, the project's objective was to implement an evidence-based educational intervention to improve healthcare providers' knowledge of medication reminder smartphone apps by 100% based on post-education test results. Ji and Hong (2020) highlighted that full adherence to antidepressants is recommended for optimal treatment of depression. Therefore, the project also sought to improve the level of antidepressant medication adherence among patients with depression by 100% within five weeks based on post-intervention medication adherence data. Healthcare providers are guided by the APA guidelines to facilitate depression management, including promoting antidepressant medication adherence (APA, 2019). Thus, the project also sought to improve healthcare providers' compliance with national standards of care of antidepressant medication compliance by 100% based on post-intervention chart audit data.

PDSA Model

The model guiding the project was the plan, do, study, act (PDSA) model. The model was chosen to guide this project since it is a quality improvement project. Knudsen et al. (2019) highlighted that PDSA is a widely used model in quality improvement projects, which commonly involve iterative cycles as the cornerstone of quality improvement in healthcare. The study by Knudsen et al. (2019) examined whether the PDSA model improves clinical practice and patient

outcomes when conducted according to the method's key features. Breckner et al. (2017) examined whether the model was an effective tool for improving medical adherence among patients, Katowa-Mukwato et al. (2021) examined whether the model can be used to reinforce evidence-based practice (EBP), while Vordenberg et al. (2018) studied the efficacy of the model in improving simulated patient programs. All the above studies confirmed in their specific areas of study that the PDSA model is an effective tool for quality improvement. The Agency for Healthcare Research and Quality (AHRQ, 2020) also highlighted the impact of the PDSA model as a crucial tool in facilitating quality improvement projects in healthcare. Therefore, the PDSA model is reliable in clinical practice and was thus chosen to guide the implementation of this quality improvement project.

The PDSA model was developed by Walter Shewhart and Edward Deming (Chen et al., 2021; Taylor et al., 2014). Deming was a statistician and developed the model as a tool to improve efficiency in business. The PDSA was then customized to guide quality improvement in different fields, including the healthcare system. Its simplicity and practicality have made it possible to be adopted in the medical field, and the adoption by the Institute for Healthcare Improvement accelerated its use as a tool for quality improvement in the medical field. It began as the Deming wheel and developed into the PDCA and, later, the PDSA cycle. The PDSA cycle seeks to efficiently pilot new ideas in a structured way to facilitate knowledge of the effectiveness of an intervention (Chen et al., 2021). Based on the PDSA model, the facility lacks a plan to support patients with depression to remain adherent to antidepressants. Thus, developing and implementing a medication adherence reminder application could contribute to assessing the intervention's impact and making changes or modifications to the facility process to promote patient antidepressant medication adherence.

Major Tenets

Planning is the first major concept of the PDSA model. It involves identifying a team of stakeholders, developing goals, measurements, and an execution plan (Chen et al., 2021). The second tenet of the PDSA model is Do, which involves piloting the interventions and collecting data. The third tenet, Study, involves evaluating project outcomes and determining the effectiveness of the project intervention by investigating the trends and patterns and identifying what worked or failed to work (Chen et al., 2021). The fourth tenet is act, which involves modifying and retesting, adopting, scaling up, or testing a new intervention. The above activities are based on the project outcomes concerning the desired outcome. A favorable outcome results in adoption, a negative outcome results in using a different approach, and if new challenges in the project implementation cause problems, the project can be modified to facilitate change (Chen et al., 2021).

Application to the Project

Planning in the PDSA model necessitates allocating resources and developing goals for the project. Consistent with the planning phase, the stakeholders in the project included healthcare providers working with patients with depression. The goal was to implement an evidence-based educational intervention to improve healthcare providers' knowledge of medication reminder smartphone apps by 100% based on post-education test results. The project was anticipated to contribute to improved antidepressant nonadherence. The execution plan included determining how to implement an educational intervention for all healthcare providers and prescribing medication reminder smartphone apps to patients taking antidepressants. During the project, the do tenet was planned to be met through educating healthcare providers on medication reminder smartphone apps and prescribing the smartphone apps to patients with depression to prevent

nonadherence. Data collection was the study part of the model, and it entailed gaining all the relevant insight needed to make an informed decision. Data collected in the project included the knowledge levels of the healthcare providers participating. The outcomes of the proposed project intervention would be evaluated to determine whether the project led to improved provider knowledge of medication reminder smartphone apps. The project outcomes would determine the actions that should be taken concerning the project intervention within the facility, which would constitute the act part of the model. If the desired goal is met, based on the evaluation of the project outcomes, the intervention was planned to be modified or adapted to facilitate antidepressant adherence among patients with depression.

Section 4

This section highlights the methods involved in implementing an evidence-based practice project to educate mental healthcare providers on improving antidepressant medication adherence among adults with depression using medication reminder smartphone apps (Raveouri et al., 2021). This section also addresses the project implementation plans, including the population of interest, project setting, and stakeholders.

Population of Interest

The direct population involved in the project includes healthcare providers working at the project site. The providers included two psychiatric nurse practitioners, four registered nurses, and four licensed vocational nurses. The number of healthcare providers was ten. Demographically, most of the providers were middle-aged and constituted different racial backgrounds, including African Americans, Asians, and Whites. The providers had worked within the facility for a minimum of four years. The eligibility criteria for the direct population were as follows. The inclusion criteria were mental healthcare providers working at the facility, part-time or full-time employees aged 18 to 65 with a valid practice license, roles of psychiatric nurse practitioner, registered nurse, licensed vocational nurses, or ancillary staff, and literate in English or Spanish.

The rationale was that mental healthcare providers are directly involved in providing mental healthcare, which provides the opportunity to promote the use of medication reminder applications. Ancillary staff were included, given the likelihood that they may interact with patients regarding questions on the project's implementation. The exclusion criteria were mental healthcare providers or staff who are not working at the facility or providers lacking a valid practice license. The rationale was that authorization for the project had only been obtained from the project site and included the providers and personnel working at the project site. Lacking a

practice license was an exclusion since the provider fails to meet regulatory requirements for practice, which may jeopardize the project (Feldstein & Graboyes, 2021).

The indirect population included adults aged 18 to 65 with depression who were on antidepressant prescriptions. Notably, the adults missed taking two or more doses per week and were from different racial backgrounds, including White, Black, Latino, and Asian. Participants were eligible to constitute the indirect population if they were patients aged 18 and above, of any gender, receiving routine mental healthcare from the facility, owning and able to use a smartphone, having access to the internet, with any level of education, having access to the project site location, and willing and able to commit four weeks to the project. The rationale for the above inclusion criteria was to meet the specific population focus, including adults with depression and the project intervention involving the use of a smartphone app intervention, which requires owning a smartphone. Another rationale was inclusivity, which allowed participants of any gender and race. Also, people who haven't graduated high school and can still operate smartphones were included. The project was specific to adults as a population of interest who met ethical requirements concerning providing valid consent to the project (Manti & Licari, 2018). Participants were ineligible if they were adults without a primary diagnosis of depression, unable to operate a smartphone, or had used smartphone app intervention for medication adherence. The above exclusion criteria excluded people who failed to meet the project's population and could not implement the intervention, which could uphold the internal validity of the project. People who have used similar applications were excluded due to concerns about bias.

Project Setting

The project site was a facility within an urban setting in Colton, Southern California. The facility is an outpatient office and a psychiatric mental healthcare facility that offers services

including addiction counseling, transgender healthcare, neurofeedback therapy, psychiatric services, and treatments for mental health conditions such as bipolar, depression, anxiety, and panic therapy. The facility is a private practice with a total of about ten staff. The facility receives about 200 patients monthly, or about 50 per week. Most of the adults seeking healthcare at the facility are middle-aged and come from middle-to-high-income households. Notably, most patients visiting the facility are female, aged between 25 and 55, White, and employed. The clinic's owner is also the facility administrator and a certified primary mental healthcare nurse practitioner (PMHNP) (Birch et al., 2021). Healthcare providers working at the facility include psychiatric nurse practitioners, registered nurses, and licensed vocational nurses. Other staff at the facility are support and ancillary staff, including a receptionist, security personnel, and a pharmacist. The healthcare providers working at the facility are employed part-time and full-time, with three full-time healthcare providers. Interdisciplinary collaboration and communication have emerged as critical components of effective mental healthcare delivery within the facility.

Stakeholders

Several stakeholders were involved in the project to facilitate its implementation within the project site. The stakeholders included the facility administrator, psychiatric nurse practitioners and registered nurses, licensed vocational nurses, the Doctor of Nursing Practice (DNP) preceptor, the DNP project leader, and the patients with depression. The facility administrator provided the overall leadership and strategic guidance to realizing the facility's mission and vision. The facility manager was also in charge of all decisions regarding the running of the facility and the facility policies. There were two psychiatric nurse practitioners, and they were responsible for providing psychiatric mental healthcare to patients receiving mental healthcare at the facility (Kumar et al., 2020).

Registered nurses and licensed vocational nurses support the psychiatric nurse practitioners and patients in the facility processes and healthcare delivery. Registered nurses' responsibilities included administering medications and educating patients on the medications, collaborating with psychiatric nurse practitioners in implementing therapeutic interventions, facilitating holistic care, advocating for patient needs within the facility, and providing ongoing support for patients and families. Licensed vocational nurses work with registered nurses to facilitate patient-centered care, monitor vitals, report changes in patients' mental health status, and communicate patients' needs (Nurses, 2017). For the purposes of this project, the DNP preceptor involved one of the psychiatric nurse practitioners, and the preceptor's role as a healthcare provider in the facility is covered above in the role of psychiatric nurse practitioners. The ancillary staff, such as receptionists, security personnel, and pharmacists, whose roles included receiving and welcoming patients to the facility, providing security, and dispensing prescribed medications to patients, respectively.

All the above stakeholders were invested in the project in various ways. During the project implementation, the owner, who is also the facility administrator, provided authorization to implement the project and granted permission to use facility resources needed for the project implementation. The nurse practitioners and registered nurses within the facility received education on the use of medication reminder smartphone apps to prescribe the apps to adults with depression. Licensed vocational nurses working at the facility also received education on the project intervention and assisted the registered nurses in providing mental healthcare to patients taking antidepressants (Nurses, 2017). The DNP preceptor guided the DNP project leader on project implementation and the facility-level insight on facility processes that the project implementation would impact. The DNP project leader implemented all the project activities and

collected and analyzed project data. Patients with depression, who were also the indirect population involved in the project, used the medication reminder smartphone apps to improve antidepressant medication adherence. The facility administrator granted permission to implement the project (See Appendix A). The ancillary staff also interacted with patients receiving healthcare at the facility, which was crucial in responding to some questions from the participants regarding the smartphone app intervention.

Interventions

The DNP project leader developed an educational PowerPoint presentation on antidepressant medication adherence based on current evidence and a pre- and post-knowledge survey for use in the project implementation process. The above resources were submitted to an expert panel for review. The project did not require IRB approval as no human subjects were directly involved during the project implementation. Participant recruitment was done through convenience sampling within the project site. During the recruitment process, the DNP project leader verbally communicated to request the facility's healthcare providers to attend a meeting on the first day of the first week of the implementation period to discuss the upcoming project. All providers who honored the invitation were received in the facility's conference room for more information on the upcoming project intervention, and interested participants were recruited.

Recruited participants were invited to an educational session on antidepressant medication adherence and received education on prescribing medication reminder apps within the facility's conference room. The DNP project leader led the education, which involved using educational PowerPoint. Several one-hour educational meetings were scheduled to accommodate shift differences among the participants. Educated participants completed the knowledge pre- and post-survey before and after the end of the educational session. Also, a demographic questionnaire was

administered to the participants at the start of the educational session. After receiving the education, the participants began prescribing a medication reminder app (Dosecast app). Pre-intervention medication adherence levels were collected from adults taking antidepressants visiting the facility, along with a chart review to determine baseline compliance with guidelines on antidepressant medication compliance. During the implementation period, the participants observed the patient using the app to ensure they understood how to use it effectively. The observation lasted 10 to 15 minutes per provider and was done once a week. At the end of four weeks of intervention implementation, a second round of chart review and collection of data on patient antidepressant medication adherence was done.

The DNP project leader then thanked the participants for cooperating in the project. The DNP project leader also compiled all the project data, and data analysis proceeded.

Planning Project Team

The DNP project leader was responsible for implementing all tasks relating to the project. The staff working at the practice site, including registered nurses, psychiatric nurse practitioners, and licensed vocational nurses, were educated on and implemented the project intervention. The psychiatric nurse practitioners played assistant roles in facilitating the project intervention implementation following the completion of the educational session. Notably, psychiatric nurse practitioners collaborated with the nursing staff and provided leadership in healthcare delivery. The psychiatric nurse practitioners collaborated with the nursing staff and addressed challenges encountered when educating patients on using the Dosecast app, besides serving as change agents by supporting and motivating the nursing staff to implement the project intervention. The DNP project leader also met with the psychiatric nurse practitioners to address any challenges with prescribing the Dosecast app and provide guidance as needed.

Resources

Some of the resources needed during the DNP project intervention included a laptop, internet, printing papers, and other stationery. The DNP project leader was responsible for the above resources. Additional sources, including a projector screen and a conference meeting room, were essential for the project implementation. The project site provided the above additional resources.

Timeline

The project lasted five weeks, and specific details on the activities implemented each week are described in the project timeline (see Appendix B).

Tools

Several tools were used in the DNP project implementation to measure medication adherence, knowledge levels, and compliance with guidelines for antidepressant medication adherence.

Demographic Data Questionnaire

The DNP project leader developed a demographic data questionnaire to collect demographic data from the project participants (see Appendix C). The questionnaire was self-administered and was completed by the participants before implementing the educational presentation for the project.

Hill Bone-Medication Adherence Scale

The Hill Bone-Medication Adherence Scale (HBMAS) is a brief instrument that was designed to assess medication adherence (see Appendix D). The scale provides a simple method for clinicians to assess patients' medication adherence levels. It is a Likert-type scale with nine items. The HBMAS was developed by Kim et al. (2000). The scale has been used by several

studies targeting medication adherence (Mishra et al., 2023; Wang et al., 2021). The tool is validated, and it has good psychometric properties. Notably, content validity was assessed through a literature review and an expert panel, ensuring relevance and appropriateness (Kim et al., 2000). Construct validity was assessed through factor analysis and testing theoretically derived hypotheses. The scale demonstrated consistent and expected relationships with related variables. The tool also has excellent reliability, where standardized alpha coefficients for the total scale were 0.74 (Kim et al., 2000) and 0.84 (Lambert et al., 2006). Permission was obtained from the tool developers. The tool was used to measure the antidepressant medication adherence levels for patients prescribed with the Dosecast smartphone app before and after the 5-week intervention implementation period.

Knowledge Pre- and Post-survey

The knowledge pre- and post-survey is a brief tool that was used to measure the knowledge levels of the healthcare providers participating in the project concerning medication adherence using medication reminder apps (see Appendix E). The DNP project leader developed the surveys for use in the project. The surveys were submitted to an expert panel, including three psychiatric nurse practitioners with over ten years of experience, who evaluated the surveys for validity. Each item on the survey was rated on a four-item scale from not relevant (1) to highly relevant (4), and a content validity index (CVI) was calculated, averaging the outcomes of the content experts' scores. CVI explores the degree to which a tool is appropriate and relevant for the sample of items of a certain construct that is being measured (Almanasreh et al., 2019). Overall, the tools had excellent validity with a CVI of one. The knowledge-pre survey was administered to the participants before the educational session was implemented, while the knowledge-post survey will be used after the educational session is completed. An expert consultation, including

two nurse practitioners working with patients with depression with over ten years of experience from a neighboring mental healthcare facility, reviewed the surveys for content and validity.

Chart Review Log

A chart review was done to determine compliance with national guidelines on antidepressant medication adherence. The DNP project leader developed the chart review log for use in the project. Permission to conduct a chart review was obtained from the facility administration. Data from the chart review was filled in the chart review log (see Appendix F), which the DNP project leader developed for use in the project. No special permission was needed to use the log, but it was submitted and reviewed for validity through expert consultation, as described in the previous section. The experts were in agreement that the chart review log was valid for use in the project.

SPSS Software

The Statistical Package for Social Sciences (SPSS) version 28 is a software used to analyze statistical data. SPSS was developed by the International Business Machines (IBM) corporation, and it is a crucial statistics software platform. The above software was used to analyze descriptive data from the participants. The software was also used to complete the paired samples t-test and Chi-square test to analyze outcomes from the knowledge surveys, HBMAS questionnaire, and chart review data. The DNP project leader completed the data analysis using the SPSS software.

Dosecast Medication Reminder App

The Dosecast medication reminder app is a smartphone app designed to assist individuals with remaining adherent to prescribed medications (see Appendix G). Montuno Software Inc. (2024) developed Dosecast to facilitate medication adherence. Individuals enter information on

the prescribed medication in the app, including the medication name, dosage, quantity, and medication method. After uploading the medications, individuals set up reminder notifications on the medications depending on the frequency of the medication intake, with the schedules spanning hours, days, or weeks. As an individual takes the medication, the Dosecast app tracks medication intake and remaining quantities, logs medication adherence, and updates the user on medication refill reminders. The app allows time zone adjustments, thus enabling users to remain adherent to medication despite traveling across time zones. The tracked medication adherence can be shared with a healthcare provider using the app. The smartphone application is available for both Android and iPhone devices. The app is also free of charge and available online.

Educational PowerPoint

An educational PowerPoint was used in the project to educate the healthcare providers on improving antidepressant medication adherence (Appendix G). The DNP project leader was guided by evidence-based literature on antidepressant medication adherence to develop the PowerPoint for the purpose of this project. No special permission is needed to use the log, but it was submitted and reviewed for validity through expert consultation, as described in the previous section. The experts were in agreement that the content of the PowerPoint was relevant to the project and addressed the practice gap.

Data Collection Plan

Surveys

The DNP project leader distributed the knowledge pre- and post-surveys in person in the facility's conference room before and after the educational sessions. The DNP project leader reminded the participants orally to complete the knowledge pre-survey before the start of the educational presentation and the knowledge post-survey after the educational session. The above

knowledge data was crucial in evaluating whether the objective of improving healthcare providers' knowledge of medication reminder smartphone apps by 100% based on post-education test results is met. Demographic questionnaires were also administered in paper format among the participants at the beginning of the intervention.

The educated participants distributed the HBMAS questionnaire to patients taking antidepressants. The questionnaire was administered in paper form during a clinical site visit before and after the 5-week intervention project implementation period. During the implementation period, the DNP project leader met with the participants face-to-face during work breaks and reminded them to administer the HBMAS questionnaire per protocol. The HBMAS data was crucial in evaluating whether the objective of improving the level of antidepressant medication adherence among patients with depression by 100% within five weeks based on post-intervention medication adherence data is met. A chart review log was used to collect the outcomes of patient chart audits focusing on the provider's implementation of project intervention. The chart review helped evaluate whether the objective of improving healthcare providers' compliance with national standards of care about antidepressant medication compliance by 100% based on post-intervention chart audit data was met.

Process Evaluation

During the implementation period, the DNP project leader observed the participants using the app to ensure that they knew how it functions and could troubleshoot if any issues arose. The observation lasted 15 minutes, and it was done weekly. Similarly, the participants observed the patient using the app to ensure they understood how to use it effectively. The observation lasted 10 to 15 minutes per provider and was done once a week. Each week, the DNP project leader would review the patient charts for medication prescriptions provided, medication adherence

evaluation, barriers to adherence, adherence goals, advice on antidepressant adherence, and prescription of the Dosecast app. Similarly, the anticipated number of charts to be reviewed was 30 to 40, and it was based on the number of patients with depression who visited the project site for clinical appointments every week. If an issue was noted, the DNP project leader would meet with the affected participant during a work break to discuss the effective chart documentation procedure and provide clarifications as needed.

Participant Privacy

The DNP project leader handled all data relating to the project. No one except the DNP project leader had access to the electronic patient chart during the chart audit. No names or potentially identifying information were collected from the participants.

Data Storage

All data relating to the project was stored in the DNP project leader's laptop, which is password-protected and accessible by the DNP project leader for electronic data, while all paper data was stored in a lockable filing cabinet within the practicum site and accessible to the DNP project leader alone. The project data will be stored for three years and later permanently deleted in the case of electronic data or shredded and discarded for paper data.

Ethics/Human Subjects Protections

Recruitment Methods

Participants were recruited through convenience sampling. Convenience sampling is a non-probability sampling method whereby data is gained from a group of easily accessible and available participants by an investigator, meaning that the sample is conveniently available (Andrade, 2020). In the above convenience sampling process, the DNP project leader verbally communicated to request the facility's healthcare providers to attend a meeting on the first day of

the first week of the implementation period to discuss the upcoming project. All providers who honored the invitation will be received in the facility's conference room for more information on the upcoming project intervention, and interested participants will be recruited.

Benefits and Risks

Participants were educated on prescribing the Dosecast app to improve medication adherence. The project would improve the knowledge needed by the participants to facilitate prescribing apps to improve antidepressant medication adherence. The routine facility practices could improve, including prescribing the Dosecast app as a routine intervention for improving patient antidepressant medication adherence. The intervention could not pose any significant risks to the participants. However, adults with depression using the app were educated on privacy concerns with the app and to avoid sharing app data with other individuals to prevent a breach of patient privacy on health and medication. No compensation was provided to the participants.

Ethics/IRB Process

The project did not require Touro University IRB review since it did not have direct contact with patients. The facility, which is the practicum site for the project, did not have an internal QI committee oversight. The DNP project leader for this project completed the CITI course along with the project team determination document, indicating there is no need for IRB approval.

Data Analysis Plan

Statistical tests

The first objective was to improve healthcare providers' knowledge of medication reminder smartphone apps by 100% based on post-education test results. The data was collected using a knowledge survey and analyzed using a paired sample t-test. A table format and a graph

were used to demonstrate the outcomes of the analysis. The rationale for the above statistical test is that the variable would be collected from the same sample but involving pre- and post-intervention outcomes (Xu et al., 2017). The variable was categorical. The alpha level was 0.05.

The second objective was to improve the level of antidepressant medication adherence among patients with depression by 100% within five weeks based on post-intervention medication adherence data. The data was collected using a Hill Bone Medication Adherence Scale and analyzed using a paired samples t-test. A table format and a graph were used to demonstrate the outcomes of the analysis. The rationale for the above statistical test was that the variable would be collected from the same sample but involving pre- and post-intervention outcomes (Xu et al., 2017). The variable was categorical. The alpha level was 0.05.

The third objective was to improve healthcare providers' compliance with national standards of care about antidepressant medication compliance by 100% based on post-intervention chart audit data. The data was collected using chart review and analyzed using a Chi-Square test. A table format was used to demonstrate the above analytical outcomes. The rationale for the above statistical test was that the variable was collected from the same sample. The variable was categorical. The alpha level was 0.05.

Descriptive statistics were also calculated to determine the descriptive characteristics of the sample. Mean and standard deviation were calculated for age, while frequencies were calculated for gender, race, profession, and years worked in the facility. The above data outcomes were planned to be demonstrated in a table.

Assumptions

The assumptions involved in a paired samples t-test state that participants are randomly sampled, the dependent variable is normally distributed, and there is homogeneity of variance

(Polit, 2014). The assumptions involved in a Chi-square test state that each cell in the contingency table has an expected frequency of more than zero, the observations are independently and randomly sampled, and the variables under analysis are categorical (Polit, 2014).

Analysis Process

The DNP project leader implemented the data analysis for the project after the implementation period. The data analysis was conducted using the Statistical Package for Social Sciences software version 28.

Section 5

Results

The healthcare providers who took part in the project were 15. Notably, the average age of the participants was 46.21 (*SD* = 4.18). Most of the participants were female (73.3%, *n* = 11), White (53.3%, *n* = 8), registered nurses (46.7%, *n* = 7), and had worked within the facility for 6 to 10 years (46.7%, *n* = 7). The sociodemographic outcomes of the participants are reflected in Table 2 below.

Table 1

Participant Sociodemographic Outcomes

Variable	Frequency (%)	*M (SD)*
Age		46.21 (4.18)
Gender		
Male	3 (20.0)	
Female	11 (73.3)	
Non-binary	1 (6.7)	
Race		
White	8 (53.3)	
African American	4 (26.7)	
Asian	2 (13.3)	
Hispanic/Latino	3 (20.0)	
Profession		
Licensed vocational nurse	3 (20.0)	
Registered nurse	7 (46.7)	
Psychiatric nurse practitioner	3 (20.0)	
Social worker	2 (13.3)	
Years worked at the facility.		
1 – 5	4 (26.7)	
6 – 10	7 (46.7)	
11 – 15	2 (13.3)	
Above 15	2 (13.3)	

Note: N = 15

The knowledge outcomes of the participants before and after the educational session were collected and compared to determine the change in knowledge levels before and after the

intervention. The HBMAS outcomes from patients with depression who received the Dosecast app intervention to facilitate medication adherence were also analyzed, revealing a reduction in medication nonadherence. The average pre-intervention knowledge level was 68.20 (*SD* = 4.144), while in the post-intervention, the knowledge level increased to 96.00 (*SD* = 2.299) (Figure 1). As reflected in Table 2 below, comparing the average pre and post-interventional outcomes revealed a significant increase in knowledge levels ($p < .001$). Among the 30 patients who received the Dosecast app intervention, the average HBMAS outcome was 27.93 (*SD* = 2.94), while in the post-intervention, the average HBMAS outcome reduced to 2.33 (*SD* = 1.84). The reduction was significant ($p < .001$). Although a paired samples t-test was crucial in completing the above analysis, the assumption of randomization of participants was violated since the project used a convenient sample. However, other assumptions of the test, stating that the dependent variable is normally distributed and that there is a homogeneity of variance, were met.

Figure 1

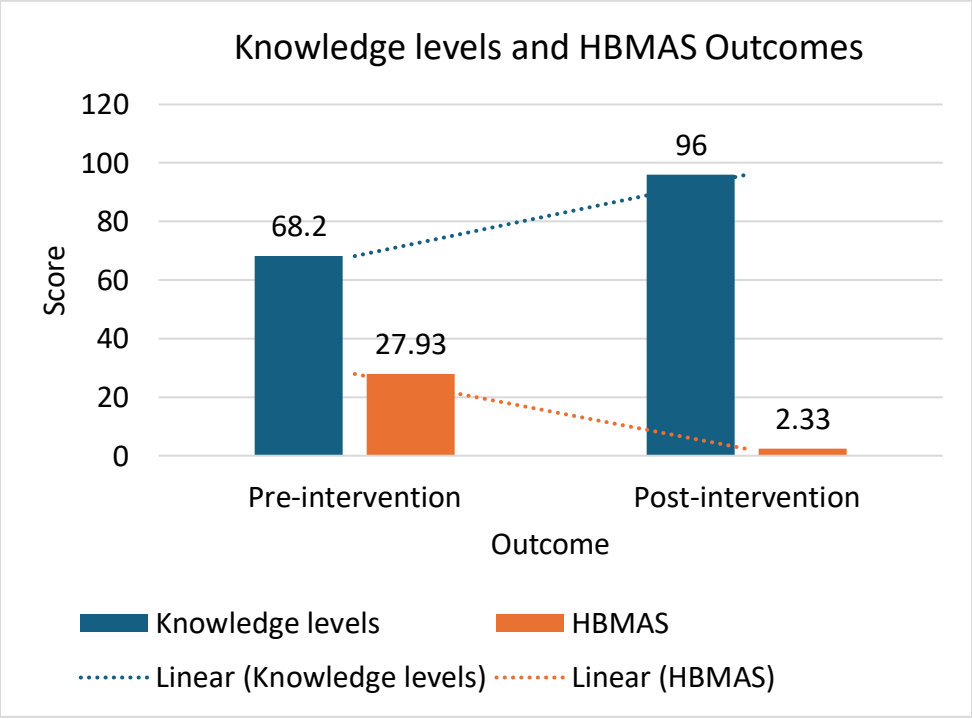

Table 2

Paired Samples Test Results for Knowledge Test Outcomes

		Paired Differences					*t*	*df*	Significance
				Std. Error	95% Confidence Interval of the Difference				
		Mean	SD	Mean	Lower	Upper			Two-Sided *p*
Knowledge	Post - Pre	-27.00	4.074	1.052	-30.056	-25.544	-26.426	14	<.001
HBMAS	Post - Pre	25.60	4.607	1.050	23.348	27.852	-24.377	29	<.001

The healthcare provider's compliance level in implementing the project intervention to promote antidepressant medication adherence was also analyzed after completing chart reviews before and after the intervention implementation. Table 3 below shows a significant association between the intervention implementation and improved compliance with promoting antidepressant medication adherence, X^2 (N = 30) = 5.812, p = .016. Assumptions of the Chi-square test we met except for the assumption of randomization, whereby the observations were obtained from a convenient sample.

Table 3

Compliance with Promoting Antidepressant Adherence

Level of Compliance	Pre-intervention	Post-intervention	Total
Compliance	6	29	35
Noncompliance	24	1	25
Total	30	30	60

Note: N = 30, X^2 = 5.812, p = .016

The project timeline was five weeks, including educating the providers on the Dosecast app intervention and baseline chart review, followed by prescribing the app intervention to patients with depression and collecting post-interventional data in the fifth week (Appendix I). Baseline HBMAS outcomes were collected from the patients, and post-intervention HBMAS outcomes were collected during the last week of the project's implementation. Further, a post-intervention chart review was done in the fifth week to determine compliance with promoting antidepressant medication adherence using the Dosecast app. There were no modifications to the timeline, as the project intervention lasted five weeks. Failure of patients to return to the project site during their scheduled visit contributed to missing post-interventional HBMAS data for three patients.

Summary

Critical findings include the differences in pre- and post-interventional outcomes for the inferential project data and the statistical significance of the results. Notably, there was a significant increase in the knowledge level of the providers concerning improving antidepressant medication adherence using the Dosecast app and a significant reduction in antidepressant medication nonadherence. Therefore, the level of patient compliance with antidepressant medication following the use of the medication reminder app intervention was significant. Further, there was a significant increase in the number of patient charts showing healthcare providers' compliance with supporting patients to remain adherent to antidepressant medications by prescribing the Dosecast app intervention.

Strengths of the project include healthcare providers participating in the project to completion, improvements in the knowledge levels of the participants, and improved compliance with the supporting patients to remain adherent by prescribing the Dosecast app intervention. The

outcomes support the impact of the intervention in improving target patient outcomes. However, weaknesses include violating the *t*-test assumption of randomization, which may reduce the reliability of the test outcomes. Self-report bias in the data collection tools such as the HBMAS and the knowledge surveys may reduce the reliability of the outcomes. Some of the bias may stem from exaggerated responses, recall bias, acquiescence bias, and social desirability bias in the responses to the knowledge survey and HBMAs questionnaire. The project outcomes may also have minimal generalizability since the project was implemented in a single setting and there was an over-representation of female participants. Thus, it could be challenging to generalize the outcomes to other healthcare facilities providing healthcare to patients taking antidepressants due to different sociodemographic outcomes. The long-term outcomes of the project intervention could not be determined due to the short duration of the project. The project also encountered attrition as three adults with depression failed to come in for the post-intervention HBMAS data collection. The above outcomes support that crucial and impactful findings were noted despite the methodological issues encountered in the project implementation process, which bear statistical significance.

Interpretation

The project outcomes supporting increased antidepressant medication adherence following implementing a medication reminders smartphone app intervention align with previous literature. Notably, González de León et al. (2022) supported using mobile technologies to improve medication adherence. Similarly, Patoz et al. (2021) highlighted the significant potential of mHealth interventions, including smartphone apps, in promoting medication adherence by expanding that smartphone applications could guide patients in taking medication as prescribed and contain functionalities to assist patients in navigating daily life, such as medication reminders.

Backes et al. (2021) added that besides sending reminder notifications to individuals under medication, the use of medication reminder apps can help mental healthcare providers tailor the patient treatment regimen to support patient adherence. Consistent with the above findings, the project outcomes highlighted that educating healthcare providers working with patients with depression on prescribing medication reminder apps can improve the knowledge needed to prescribe the apps and facilitate improved treatment adherence.

The outcomes should contribute to nursing practice by guiding healthcare providers working with patients taking antidepressants in prescribing the use of medication reminder apps to improve antidepressant adherence. Notably, the outcomes reinforce using innovative mobile health interventions to promote population health outcomes, including improving medication adherence (Hartch et al., 2023). Therefore, the medication reminder app intervention could be diversified to incorporate the use of the intervention as a routine health behavior promotional intervention for other mental healthcare conditions managed through psychotropic medications besides antidepressants. Further, the use of medication reminder apps could reduce the burden of depression among individuals by promoting compliance with treatment interventions. Therefore, many individuals will become adherent and realize treatment goals. The improved adherence to antidepressants could result in a reduction in healthcare spending for depression management (Hockenberry et al., 2019). The incorporation of digital healthcare promotion interventions may revolutionize healthcare systems to promote effective patient follow-up with treatment and reduce healthcare spending for undermanaged depression or unused medications, which lead to outcomes such as depression comorbidities.

The observed outcomes align with the anticipated outcomes as the project was envisioned to contribute to improved antidepressant adherence, knowledge of medication adherence

interventions incorporating a medication reminder application, and improved healthcare interventions for promoting antidepressant medication adherence. There were minimal costs and tradeoffs associated with the project as the project timeline was adhered to without any changes, the resources for the project were available and utilized as planned, and no additional costs were encountered in the project.

Limitations

Several limitations could impact the project outcomes. The project used a convenience sample, which violated the assumptions of the statistical tests and may have reduced the reliability of project outcomes. The responses from the participants during the data collection process could be prone to self-report bias, including recall bias, exaggerated responses, or social desirability bias, which could reduce the reliability of the project outcomes. The project also had a small study duration, which limited the investigation of the long-term outcomes of the intervention. The project also had a small sample size, which reduced the rigor of the project data and could reduce the reliability of the outcomes. The project was implemented in a single clinical site, and the outcomes may not be easily generalizable to other settings, which may have different socio-economic and demographic characteristics. Despite the above limitations, efforts to minimize the limitations would involve developing a longitudinal study with a randomized sample and a longer duration of about six months. Such a study could facilitate exploring the long-term outcomes of the project intervention in facilitating long-term antidepressant medication adherence.

Conclusion

A quality improvement project was implemented to guide healthcare providers in improving antidepressant medication adherence by prescribing medication reminder smartphone applications to adults with depression. The healthcare providers were educated on the use of the

Dosecast medication reminder application to assist patients with depression in remaining adherent to medication. Three outcome measures were explored, including knowledge of medication smartphone apps, HBMAS outcomes, and healthcare providers' compliance with standards on antidepressant medication by promoting adherence. Significant improvements in the above outcome measures were noted, including improvements in knowledge of medication reminder applications from 68.20 (SD = 4.144) to 96.00 (SD = 2.299) and the provider's compliance with helping the patients adhere to the antidepressant medications (p = .016). There was also a significant reduction in patient nonadherence with antidepressant medication after they were prescribed the medication reminder application (p <.001). The outcomes may guide healthcare providers within the project site to adopt technologies such as medication reminder smartphone apps to improve antidepressant adherence and reduce the burden of undermanaged depression. Therefore, healthcare providers will meet the APA guidelines on assisting patients on antidepressants to remain adherent to facilitate mental wellness (APA, 2019).

The project's sustainability will be enhanced through several interventions. The project leader sought collaboration with a nurse practitioner within the project site who will monitor the intervention implementation regularly and address any issues or concerns. The information technologist will develop prompts in the patient EHRs to remind providers to prescribe the smartphone app intervention. The facility policies will be adapted to include prescribing medication reminder smartphone apps as part of the routine interventions for patients on antidepressant prescriptions. The above action may result in the facility-wide adoption of modern patient care technologies, resulting in a culture of patient-centered care and the use of mobile health technologies. Any challenges will be addressed by making relevant adaptive interventions to promote the seamless implementation of medication reminder smartphone applications among

adults taking antidepressants. For instance, if the providers fall back on prescribing the smartphone apps, as highlighted by a review of patient records, the nurse practitioner will organize a meeting to review the importance of the intervention and remind the providers to continue prescribing the apps. The nurse practitioner will also demonstrate leadership by implementing the intervention among adults taking antidepressants, thereby modeling how the intervention could be integrated into the patient's treatment plan. The above measures will maintain the sustainability of the intervention.

The project outcomes may influence improvements to nursing practice by adopting medication reminder smartphone apps as routine interventions to support patients in becoming adherent. Improved depression outcomes among patients following better treatment adherence to antidepressants may generate an impetus to adopt the use of medication reminder app technologies in nursing care settings to promote antidepressant adherence. Therefore, nurses working with patients with depression and facilities providing mental healthcare will become more confident in the applicability of mobile reminder applications as an evidence-based intervention for addressing non-adherence problems, which could lead to improvements in the quality of patient care. Also, the patient-provider relationship may be improved as nurses become more involved in assisting patients to adhere to medications, thereby promoting improved patient-provider contact and follow-up.

The project may also lead to the development of policies impacting depression management, including the integration of modern technologies, such as smartphone reminder apps, to promote treatment adherence. Notably, the APA does not provide specific guidelines on using smartphone apps for medication adherence. However, the APA provides general guidelines on treatment adherence that may guide mental healthcare providers in depression management

(APA, 2019). The Department of Veteran Affairs (VA, 2022) is not specific about using medication reminder apps but supports the need to assess medication adherence. Therefore, the next steps could involve expanding guidelines and policies within mental healthcare practice to include patient technologies such as medication reminder smartphone apps. Such adjustments could be made at local and state levels to facilitate improvements in nursing practice. Replicating the quality improvement project in facilities providing mental healthcare could result in system-wide improvements in depression healthcare. The outcomes of this project could also inform similar projects to improve psychotropic medication adherence using medication reminder smartphone apps among individuals with other mental health issues besides depression.

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Appendix A

Facility Permission Letter

Brainiac Medical Corporation

1007 E. Cooley Dr

Suite 111

Colton, CA 92324

Phone: (909) 280-8014

11/17/2023

RE: Permission to Conduct Doctor of Nursing Project

The management of Brainiac Medical Corporation has agreed to allow May Ogbozor, a DNP student from Touro University, to carry out her Doctor of Nursing Project titled "Increasing Compliance to Antidepressant Medication Regimens in Adults Diagnosed with Depression Through Education of Psychiatric Mental Healthcare Providers on the Use of Medication Reminder Smartphone Apps" at our facility from February to March 2023. I have reviewed the project's details and found it aligns with our facility's mission. We support her work with our patients and look forward to the outcomes of her studies. All HIPPA protocols will be observed.

Please do not hesitate to contact me if you need further information.

Respectfully,

Dr. Khadija Hamisi, DNP, CTCS, CSAP, PMHNP-BC, APRN.

Appendix B

Project Implementation Timeline

Introduction	
Project Site	Brainiac Medical Corporation, Colton, CA 92324
Project Mentor	Dr. Khadija Hamisi, DNP, CTCS, CSAP, PMHNP-BC, APRN
Project Purpose	To educate healthcare providers on improving antidepressant medication adherence among adults taking antidepressants
Project Question	"Among psychiatric mental healthcare providers (P), does implementing an educational intervention on medication adherence using smartphone apps (I) compared to usual care (C) improve compliance with the intervention and improve medication adherence in patients taking antidepressants (O)?"
Project Timeline	
Plan out the activities you will be performing each week during the implementation phase of Project III. Clearly delineate the time needed to carry out interventions, collect data, and evaluate the project. Set concrete dates for all implementation activities (e.g., trainings/education, interventions, data collection and analysis) and include them in the appropriate weeks below. **Dates for implementation are posted in the Project II course announcements. Week 1 should correlate with the first week of DNP Project III, unless permission is granted to implement early.**	
Week 1 (Dates)	• Educating participants on improving antidepressant medication adherence using smartphone apps • Collection of pre- and post-intervention knowledge data from the participants. • Implementation of baseline chart review to determine compliance with national standards of care about antidepressant medication compliance. • Participants begin prescribing medication reminder apps after receiving the educational intervention.
Week 2 (Dates)	• The participants will continue implementing the intervention involving prescribing medication reminder apps (Dosecast app).

Week 3 (Dates)	• The participants will continue implementing the intervention involving prescribing medication reminder apps (Dosecast app).
Week 4 (Dates)	• The participants will continue implementing the intervention involving prescribing medication reminder apps (Dosecast app).
Week 5 (Dates)	• The participants will continue implementing the intervention involving prescribing medication reminder apps (Dosecast app). • Collection of post-intervention data through a second round of chart review and collection of data on patient antidepressant medication adherence.

Appendix C

Demographic Data Questionnaire

Demographic Information (*Kindly tick/fill in the most appropriate answer according to you*)

1. What is your age?

   _____

2. What is your gender?

   ☐ Male
   ☐ Female
   ☐ Non-binary
   ☐ Transgender male
   ☐ Transgender female
   ☐ Prefer not to answer.

3. What is your race?

   ☐White
   ☐ African American
   ☐ Asian
   ☐ Hispanic/Latino
   ☐ Prefer not to answer.

4. What is your profession?

   ☐ Licensed vocational nurse.
   ☐ Certified nurse assistant
   ☐ Registered nurse
   ☐ Psychiatric Nurse practitioner
   ☐ Social worker
   ☐ Other _____(Specify)

5. How many years have you worked as a healthcare provider in this facility?

   ☐ 1 – 5
   ☐ 6 – 10
   ☐ 10 – 15
   ☐ Above 15

Appendix D

HBMAS

Scale Name: The Hill-Bone Medication Adherence Scale.

Questions		1 = None of the time. 2 = Some of the time. 3 = Most of the time. 4 = All the time.
1.	How often do you forget to take your antidepressants?	
2.	How often do you decide NOT to take your antidepressants?	
3.	How often do you forget to get your prescriptions filled?	
4.	How often do you run out of antidepressants?	
5.	How often do you skip your antidepressants before you go to the doctor?	
6.	How often do you miss taking your antidepressants when you feel better?	
7.	How often do you miss taking your antidepressants when you feel sick?	
8.	How often do you take someone else's antidepressants?	
9.	How often do you miss taking your antidepressants when you are careless?	

Scoring: The range is from 9 to 36.

Appendix E

Knowledge Pre-survey

Kindly circle the most appropriate answer according to you.

1. Medication adherence involves which of the following statements?

   A. Taking prescribed antidepressants at different times and different dosages.

   B. Taking over-the-counter medications in the correct dosage and timing.

   C. Taking prescribed antidepressants following the prescribed medication dosing regime.

   D. Patient behavior in adhering to treatment.

2. Which of the following statements is the most correct about the primary reason for prescribing antidepressants in mental healthcare?

   A. To generate revenue for the healthcare system.

   B. To address underlying biological factors causing depression.

   C. To meet patient expectations.

   D. To comply with professional guidelines on prescription practices.

3. Which of the following is the most correct statement about the burden of nonadherence?

   A. Patients must maintain an adherence rate above 50% for therapeutic effect.

   B. Less than 25% of patients taking antidepressants discontinue their medications after a month of treatment.

   C. Less than 50% of patients taking antidepressants are adherent after six months of treatment.

   D. Medication adherence is the patient's sole responsibility.

4. Which approach is most effective in involving patients in medication decisions?

   A. Making decisions without consulting patients.

   B. Clearly explain treatment options and involve patients in shared decision-making.

C. Prescribing medications without discussing alternatives.

D. Assuming patients prefer not to be informed about their medications

5. What is a common barrier to medication adherence in mental healthcare?

A. Limited availability of medications in the market.

B. Lack of trust in healthcare providers.

C. Prescribing only one type of medication.

D. Not discussing potential side effects with patients.

6. Which of the following statements is false concerning the American Psychological Association guidelines on depression management.

A. Antidepressant medications are more impactful than therapeutic interventions in depression management.

B. Best practices cannot benefit a patient if the patient cannot adhere to treatment due to several barriers.

C. Healthcare providers can deviate from the protocol or stop a specific treatment if it is not working based on sound clinical judgments.

D. Supporting patients in educational and decision-making capacities can help promote patient compliance with treatment.

7. Medication reminder smartphone app interventions are freely available and improve antidepressant medication adherence.

A. True

B. False

8. How important is patient feedback in adjusting medication regimens?

A. Not important; healthcare providers should solely rely on clinical assessments.

B. Moderately important; only consider feedback if it aligns with clinical observations.

C. Highly important; integrate patient feedback into decision-making alongside clinical assessments.

D. Irrelevant; medication regimens should not be adjusted based on patient input.

9. Which of the following is an example of a tool or strategy to support medication adherence?

A. Avoid discussing medications to prevent patient stress.

B. Encourage patients to skip doses occasionally to avoid dependence.

C. Provide medication pillbox and smartphone reminder apps.

D. Assume that patients will remember to take their medications without any assistance.

10. When should mental healthcare providers schedule follow-up appointments to discuss medication adherence with their patients?

A. Only if patients request follow-up.

B. Monthly.

C. Based on clinical judgment, but regularly throughout the treatment period.

D. Only when adjusting medication dosages.

Knowledge Post-survey

Kindly circle the most appropriate answer according to you.

1. Medication adherence involves which of the following statements?

   A. Taking prescribed antidepressants at different times and different dosages.

   B. Taking over-the-counter medications in the correct dosage and timing.

   C. Taking prescribed antidepressants following the prescribed medication dosing regime.

   D. Patient behavior in adhering to treatment.

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   D. Medication adherence is the patient's sole responsibility.

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   F. Clearly explain treatment options and involve patients in shared decision-making.

   G. Prescribing medications without discussing alternatives.

H. Assuming patients prefer not to be informed about their medications

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G. Healthcare providers can deviate from the protocol or stop a specific treatment if it is not working based on sound clinical judgments.

H. Supporting patients in educational and decision-making capacities can help promote patient compliance with treatment.

7. Medication reminder smartphone app interventions are freely available and improve antidepressant medication adherence.

A. True

B. False

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A. Only if patients request follow-up.

B. Monthly.

C. Based on clinical judgment, but regularly throughout the treatment period.

D. Only when adjusting medication dosages.

Appendix F

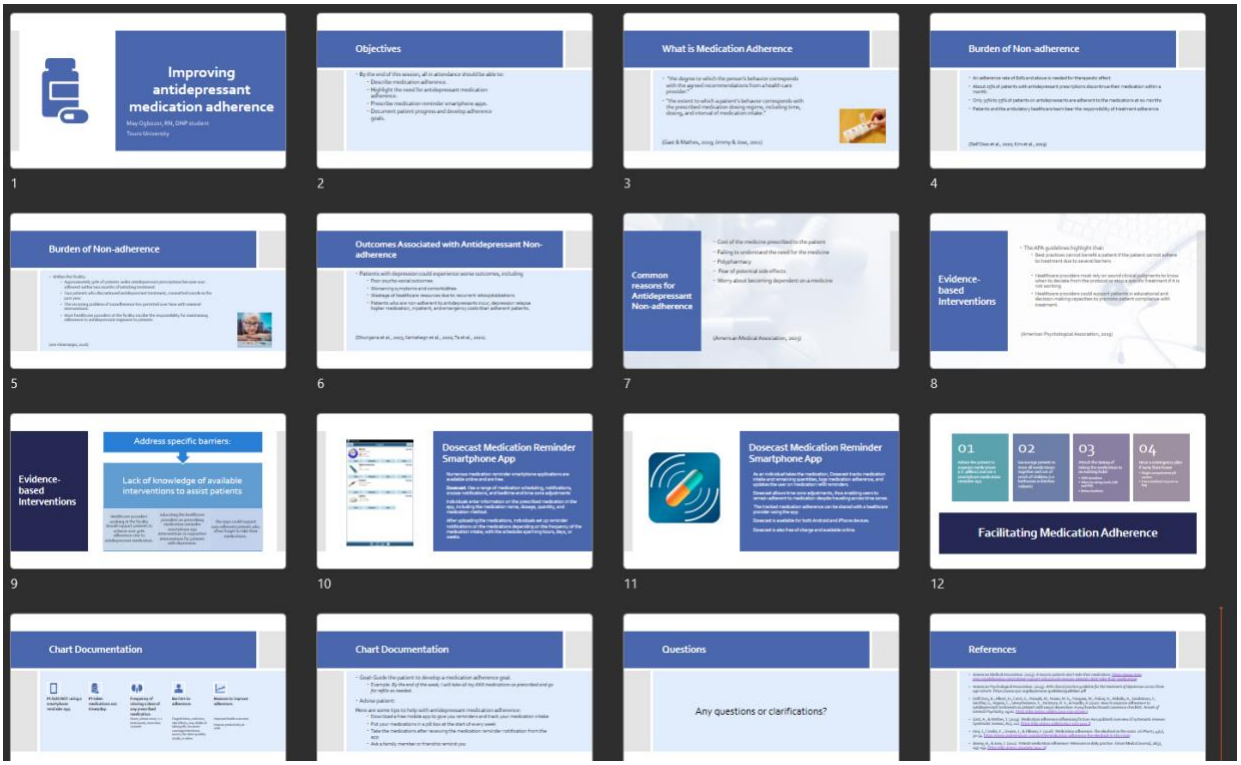
Chart Audit Log

Patient	Medication prescription provided	Medication adherence evaluated	Barriers to adherence	Adherence goals	Advise on antidepressant adherence	Prescribed Dosecast app	Total
001							
002							
003							
004							
005							
006							
007							
008							
009							
010							
011							
012							
013							
014							
015							
016							
017							
018							
019							
020							
021							
022							
023							
024							
025							

- To audit the patient files for documentation of each of the above. A tick is placed for recommendations that are met.

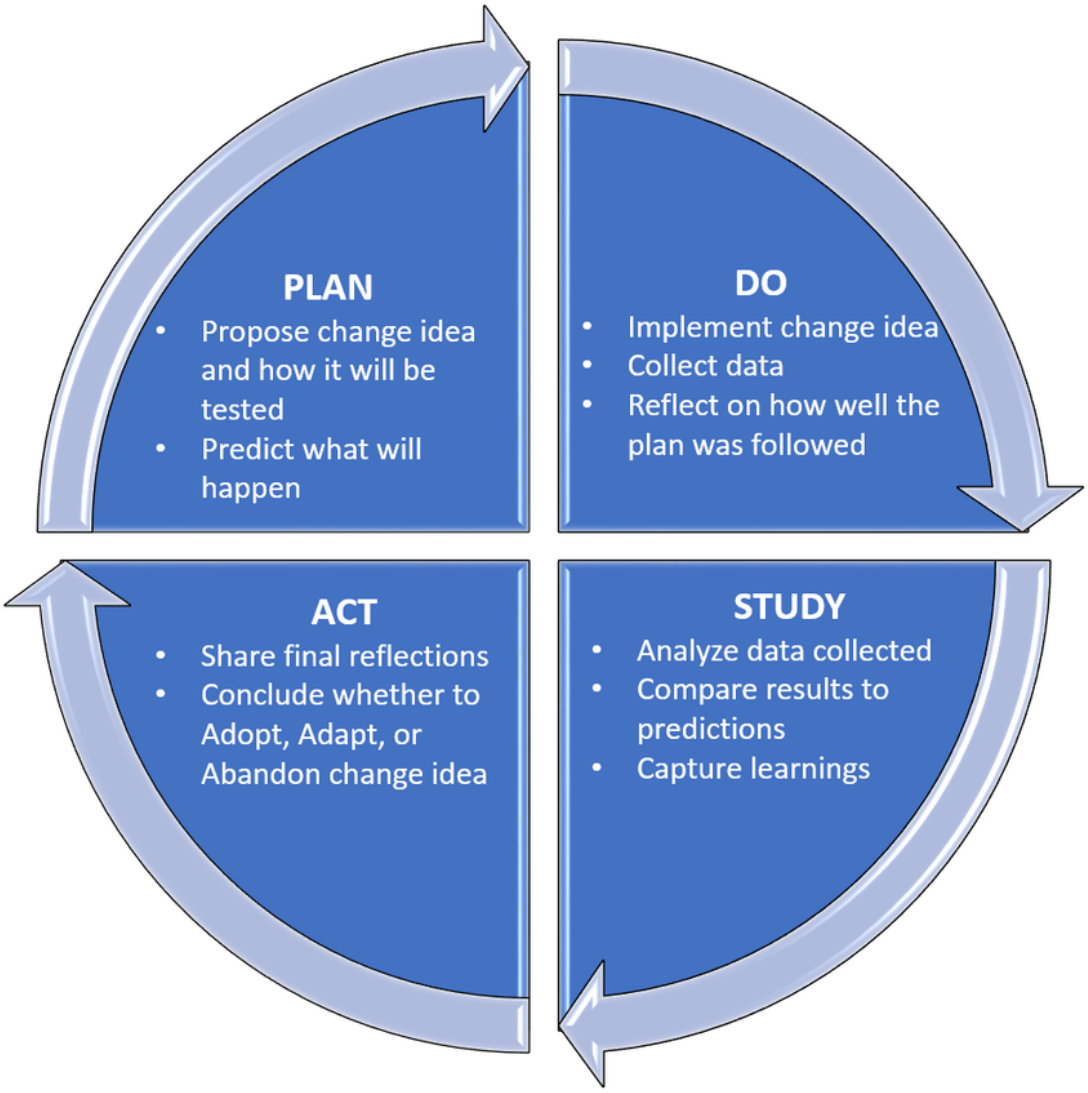
Appendix G

Educational PowerPoint



Appendix H

Graphic of the PDSA



Appendix I

Timeline of the Project Interventions