Improving Antipsychotic Adherence Among Individuals with Schizophrenia Spectrum Disorders Admitted to an Inpatient Psychiatric Unit: A Quality Improvement Project

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Abstract

Nature and Scope of the Project. Antipsychotic nonadherence is the most common contributing factor associated with readmission of patients with schizophrenia spectrum disorders (SSD). This quality improvement (QI) project is aimed to educate registered nurses (RNs) on an inpatient behavioral health unit to complete a standardized antipsychotic adherence assessment tool – the medication adherence report scale (MARS) – with admitted patients.

Synthesis and Analysis of Supporting Literature. The MARS scores have demonstrated a significant association with antipsychotic blood serum levels, supporting its validity to evaluate or screen for nonadherence. Adherence assessments have proven clinically relevant as screening tools to identify candidates for adherence-promoting interventions. Two interventions to improve antipsychotic adherence are long-acting injectable antipsychotics (LAIA) and telehealth technologies.

Project Implementation. RNs received evidence-based educational material and a 15-minute educational session on the MARS tool and project objectives. RNs completed the MARS assessment with patients with SSD and communicated the score to the health care provider. In instances of identified low adherence, RNs educated patients on facility-specific telehealth technologies.

Evaluation Criteria. Data collection included staff signatures to verify participation and the review of patient charts to determine the rate RNs completed and communicated the results of the MARS adherence assessment of total eligible patients. Additionally, chart reviews were used to verify what percentage of eligible patients received either LAIA or telehealth education.

Outcomes. Fifty-one (93%) of RNs attended an educational session. Forty-five patients with SSD were admitted during the trial. RNs completed the MARS assessment and communicated the results of 29 patients (64%). RNs failed to offer the assessment to four patients (8%). 24 patients (83%) MARS scores indicated nonadherence. Of these 24 patients, 11 (46%) received telehealth education, and two patients (8%) were prescribed LAIA medication. In contrast, zero patients received telehealth education and one patient received LAIAs in the 30-days before the study.

Recommendations. This QI project demonstrated the value of implementing an antipsychotic nonadherence screening tool on inpatient behavioral health units that serve patients with SSD.

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In a study by the Healthcare Cost and Utilization Project (HCUP) researchers, the overall national adult 30-day readmission rate in the U.S. among all diagnosis categories fell from 14.2% in 2010 to 13.9% in 2016 (Bailey et al., 2019). Despite this collective improvement, certain subpopulations have significantly higher than average readmission rates, such as individuals diagnosed with schizophrenia spectrum disorders (SSD). SSD includes the diagnoses of schizophrenia, schizoaffective disorder, schizophreniform disorder, schizotypal personality disorder, delusional disorder, and brief psychotic disorder. The national 30-day readmittance rate for individuals with SSD was 22.4% in 2014 (Wani et al., 2019). A systematic review on rehospitalization factors reported that antipsychotic nonadherence was the most common contributor cited for readmission of patients with SSD (Shuler, 2014).

This quality improvement (QI) project recognized the importance of the role of antipsychotic nonadherence and was designed to improve the evaluation of adherence within a healthcare facility. The initiative focused on providing registered nurses (RNs) on a behavioral health inpatient unit education on conducting a standardized assessment of antipsychotic adherence among individuals with SSD and communicating that information to the patient's provider. The QI project addressed nonadherence by improving the assessment of antipsychotic adherence when compared to pre-implementation.

Problem Identification/ Available Knowledge

Nonadherence to medication has long been a pervasive and hidden issue; despite the impacts of nonadherence, there is little guidance for healthcare professionals on the most effective means to assess this problem in clinical practice.

Background

Objective medication adherence measures, considered a gold standard, include direct observation by professionals and serum drug levels. However, these measures are often costly and unavailable in clinical practice. Less invasive measurement tools that assess for adherence related behavior include: pharmacy refill and claim records, electronic medication packaging devices, and pill-counts. Lastly, subjective measurement includes clinician assessment and patient self-report. While less accurate than objective measures, subjective measurements are widely used in practice due to their low cost and ability to determine the factors for a patient's nonadherence (Lam & Fresco, 2015).

Problem Scope

Approximately 50% of U.S. patients are nonadherent to their prescribed medications for chronic illness (Brown et al., 2016). More unsettling is that the prescribed medication's nonadherence rate is higher for individuals with SSD. In a retrospective cross-sectional study of 1.2 million individuals with SSD in the U.S. prescribed oral antipsychotics, researchers found 71% of individuals had periods of nonadherence to those medications (Desai & Nayak, 2019).

Problem Consequences

In addition to increased rehospitalization rates, the repercussions of nonadherence for individuals with SSD includes exacerbation or relapse of psychotic symptoms, suicide, substance abuse, homelessness, incarceration, victimization of violence or theft, and psychiatric and medical comorbidities (Phan, 2016). There are also financial burdens upon societal and healthcare resources as nonadherence is associated with higher utilization of costly healthcare resources to manage both acute psychiatric and medical conditions (Desai & Nayak, 2019).

Knowledge Gap

Inpatient treatment facilities are common settings where the consequences of antipsychotic nonadherence are acutely present. The challenge for inpatient professionals is to determine what means of medication adherence assessment they can feasibly adopt, recognizing the cost-benefit of various means of assessment. For facilities interested in low-cost self-report medication adherence assessment questionnaires, there are several unique peer-reviewed tools available, each with its own strengths and weaknesses (Velligan et al., 2017).

Proposed Solution

Adopting a standardized medication adherence assessment tool could increase healthcare professionals could increase their ability to identify and respond to nonadherence. Two established interventions available at the facility that have proven to improve adherence among individuals with SSD are long-acting injectable antipsychotics (LAIA) and telehealth technologies. LAIA are formulations of medications developed in the 1960s that release medication over several weeks with one dose, and replace daily dosing (Stahl, 2021). Telehealth technologies that promote adherence have historically been limited to: phone calls, electronic pharmacy records, text message reminders, and emails with patients. However, a growing range of electronic records, communications systems, and mobile phone applications have demonstrated benefits on antipsychotic adherence rates as well (Bianco et al., 2021).

PICO(T) Questions

The academic focus of this evidence-based QI project was to evaluate the following questions. (1) In patients with SSD prescribed antipsychotics admitted to an inpatient unit, how does a structured antipsychotic adherence assessment tool compare to an unstructured

assessment of adherence at identifying nonadherence? Can educating RNs increase the assessment of antipsychotic adherence within a 31-day trial compared to pre-education?

Literature Review, Matrix Development and Literature Synthesis

The Searching Online Library Academic Resources (SOLAR) and Cumulative Index to Nursing and Allied Health Library (CINAHL) databases located the research articles included in this literature review. The search terms consisted of *schizophrenia*, *schizophrenia spectrum disorders*, *bipolar disorder, antipsychotic, (non)adherence, (re)hospitalization, assessment, tool, measuring, decrease, reduction, failure, long-acting injectable antipsychotics, Medication Adherence Report Survey, MARS, education, telehealth, mobile application, medication reminders, adult, inpatient,* and *outpatient.* The Boolean search modifiers, AND and OR, were used to limit, broaden and define results as necessary. Utilizing the search terms in isolation or in combination, SOLAR produced upwards of 45,000 results, and CINAHL produced 2,300 results.

Literature Inclusion and Exclusion Criteria

Research inclusion criteria included: (a) written in the English language; (b) full text was available through the St. Scholastica library or interlibrary loan; (c) published in the between 2012 and 2021; and (d) published in a peer-reviewed journal. Exclusion criteria included: (a) research written in a non-English language; (b) research published before 2012; (c) not subject to peer review; and (d) opinion pieces. There was preference for meta-analysis, systematic reviews, and randomized controlled trials published within the last five years. In instances where research from the last five years was not available, research from 2012 onward was included. Federal government resources along with the latest version of educational textbooks were utilized as supplemental information. Lastly, one classic/seminal research article from 2000 was also included.

Literature Matrix Table

A literature review was completed to develop the proposed QI initiative. A summary of information was placed in a literature matrix table located in the Appendix-B. This table provides a brief description of each journal article resource used in this work and includes the: American Psychological Association reference, study purpose, design, sample size, and applicable results.

Literature Synthesis

Literature Related to the Problem. Researchers Velligan et al. (2017) explored factors for nonadherence and identified 11 modifiable factors significantly associated with antipsychotic nonadherence in a systematic review of 36 prospective cohort or clinical trial studies. These factors were categorized as either unintentional or intentional nonadherence. Unintentional nonadherence is considered unplanned or accidental behavior resulting from cases of: cognitive impairments, depression, access to mental health care, lack of family/social support, poor social functioning, and substance abuse. Intentional nonadherence is considered planned behavior resulting from: poor insight, attitude toward medication, medication side effects, poor therapeutic alliance, and stigma. Their research observed that the factor most commonly associated with nonadherence was poor insight (55%), followed by substance abuse (36.1%), attitude towards medication (30.5%), medication side effects (27.8%), and cognitive impairments (13.4%) (Velligan et al., 2017).

Literature Related to the Significance. Recognizing the factors associated with antipsychotic nonadherence is essential to improving quality of care. To improve adherence, healthcare professionals can incorporate assessment tools to identify individuals with histories of nonadherence, and suggest if the nonadherence is unintentional or intentional. Identifying these individuals and the type of nonadherence, the healthcare team can incorporate adherence-

promoting interventions tailored to the patient's needs. Current healthcare trends demonstrate the effectiveness of simplified medication regimens to reduce frequency/complexity, modern technology, and increased social support for individuals who struggle with unintentional nonadherence. In instances where individuals are intentionally nonadherent, research supports the benefit of improved patient-provider communication, patient education, and alterations in medication regimens to optimize symptom management and reduce side effects (Velligan et al., 2017).

Although imperfect, subjective self-report information regarding adherence can indicate to a provider if a patient's current presentation results from disease progression, treatment resistance, or if the patient is unintentionally or intentionally nonadherent to the recommended treatment. Utilizing a standardized free or low-cost self-reporting tool that is easy to use by novice professionals to assess adherence has a clear benefit. Additionally, standardized assessment has demonstrated to be superior to unstructured clinician assessment, which can significantly overestimate adherence when compared to objective serum drug levels (De las Cuevas & De Leon, 2020). Once adherence, partial adherence, or nonadherence is suspected or established, a provider can incorporate that information when optimizing medication selection, focusing on shared-decision making. This patient-provider discussion on nonadherence can also help build a therapeutic alliance that is associated with improved adherence rates among individuals with SSD (Velligan et al., 2017).

Literature Related to the Consequence. The repercussions of unrecognized nonadherence may result in increased frequency of healthcare utilization, unnecessary medication changes, diagnoses of treatment resistance, and underutilization of interventions and education to address the cause of the antipsychotic nonadherence. Certain scholars that

investigated adherence believe that nonadherence begets nonadherence (Phan, 2016). In one of the largest retrospective cohort studies of its kind, researchers Desai and Nayak (2019), investigated the healthcare utilization of 1.2 million individuals with schizophrenia from 2010 to 2014 who were received Medicare. Compared to those who were consistently adherent, the consistently nonadherent population had significantly higher use of outpatient resources (0.68 vs. 1.92, $P < 0.0001$) and office visits with a healthcare provider (10.95 vs. 18.21, $P < 0.0001$) per year to manage both their physical and mental health (Desai & Nayak, 2019).

Literature Related to Shortcoming of Unstructured Clinician Assessment. In a systematic review of medication adherence assessment, qualitative research has revealed that clinician-led assessment of adherence through interview alone are prone to biases, and can result in an overestimation or underestimation of adherence by both the patient and clinician (Heeb et al., 2019). In their report, Brown et al. (2016) documented that many patients struggle with communicating accurate medication adherence or nonadherence for various reasons. First, the patient may be embarrassed regarding their reasons for not taking the medication; such as economic limitations, knowledge deficits, or personal concerns regarding the medication. Secondly, patients may worry about being chastised for admitting they were unable to remain adherent (Brown et al., 2016). The result of these communication deficits results in inconsistent adherence assessment among healthcare professionals. In a study on the accuracy of emergency room physicians' unstructured assessment of antipsychotic adherence compared to the patients' drug serum levels, the most accurate physician correctly identified 70% of nonadherent patients after completing their history and physical with the patient. In contrast, the least accurate physician correctly identified 41.5% of nonadherent patients based on their serum drug level (Lopez et al., 2017).

Literature Related to the Assessment Tool. In response to the shortcomings of unstructured clinician assessments on adherence, and the cost and unavailability of objective adherence assessment tools, standardized self-report assessment tools are a practical supplemental means for clinicians to assess for adherence. During the literature review, twelve adherence assessment tools were identified, the first of which was developed in 1978, and the most recent in 2008. The tools ranged in length from four yes/no questions, to 30-questions that utilized a 1-3 rating scales. The approximate time required to complete each tool ranged in length from 1-2 minutes to approximately 10 minutes in length. Two assessment tools were copyrighted and required a fee to use for either research or clinical practice.

One medication adherence assessment tool used to assess for antipsychotic adherence is the Medication Adherence Report Scale (MARS). Originally introduced in the classic article by Thompson et al. (2000), the MARS tool (Appendix-A Figure-2) was created to quickly assess or screen for adherence to antipsychotic medication among patients with chronic mental health diagnoses. Since its introduction, the MARS's application has broadened. It has been used to screen for and research adherence in over one hundred unique chronic health conditions that require daily medication. Additionally, the MARS has been translated into several other languages and found to have comparable reliability and validity across various socioeconomic and cultural groups (Velligan et al., 2017). Among the twelve assessment tools reviewed during the literature review, the MARS tool was selected on its relatively short length, accuracy, and open-use status. Nevertheless, a letter of permission to use the MARS assessment tool was provided by the creator.

According to Thompson et al. (2000), each of the ten questions in the MARS self-report survey addresses a behavioral medication adherence factor, including poor insight, cognitive

impairments, symptom severity, side effects, and attitude towards medication. The authors acknowledge weaknesses of all self-reported questionnaires are the recall and "yes saying" biases. Recall bias is a systematic error that occurs when individuals unintentionally recall events or experiences inaccurately. The saying yes bias, also referred to as the social desirability bias, is the tendency for individuals to self-report with the more positive "yes" response when uncertain or embarrassed, rather than admitting their fault or failure. Additionally, the saying yes bias applies to self-report tools where the desired or positive response is consistently “yes” throughout the questionnaire. The survey tool is scored by adding the number of questions answered with a “no” on questions one through one to six, nine and ten, and the “yes” on question seven and eight (Appendix-A Figure-2). In the original study, MARS patient scores demonstrated a statistically significant association with antipsychotic and blood serum levels supporting its validity. Specifically, individual scores of eight or below were significantly associated within blood serum levels outside of therapeutic ranges. The MARS tool had a Cronbach’s alpha of 0.75, indicating a strong test-retest reliability (Thompson et al., 2000). In addition to its ability to evaluate adherence, the MARS tool also identifies unintentional versus intentional nonadherence. This clinical importance of recognize the type or cause of nonadherence is improved intervention selection (Chan et al., 2019).

Self-report adherence assessment tools have demonstrated to be effective means to identify candidates for adherence-promoting interventions. In a 2013 study, researchers Sajatovic et al. (2013) successfully utilized an adherence assessment tool to identify 30 homeless or recently homeless individuals who suffered from a SSD and struggled with high rates of intentional antipsychotic nonadherence. After participants were identified, the 30 individuals received LAIA and participated in once-monthly educational sessions about medication

adherence and healthcare literacy. At the end of the six-month trial, researchers found participants' medication nonadherence dropped from 46% to 10% among all medications (both medical and psychiatric). Additionally, researchers observed that participants had significant improvement in psychiatric symptoms ($P<.001$) and significantly higher rates of living in more permanent housing ($P<0.001$; Sajatovic et al., 2013).

Literature Related to Long-Acting Injectable Antipsychotics. The most well-documented intervention to address intentional nonadherence to antipsychotics is the use of LAIAs. With unique pharmacokinetics that minimize common side-effects, LAIA formulations offer unique benefits compared to their oral equivalents (Stahl, 2021). These medications function by encapsulating antipsychotic medication into formulations that slowly degrades and releases the medication over a period of weeks. The pharmacokinetics of LAIA differ from their oral counterparts as the medication is suspended and injected into the muscle. LAIAs require only a fraction of the equivalent oral dose of the medication which maximizes positive impacts while minimizing extrapyramidal symptoms such as: acute dystonia, pseudo-Parkinson symptoms, akathisia, neuroleptic malignant syndrome, and tardive dyskinesia. Additionally, LAIAs result in a more consistent plasma concentration than oral equivalents which have peaks and troughs associated with daily dosing (Park et al., 2013). The clear advantages of utilizing LAIAs mediation include: no need for daily administration, objective adherence, reduced risk of accidental or intentional overdose, and regular contact between a patient and their healthcare team (Castillo & Stroup, 2015).

In their meta-analysis, researchers Kishimoto et al. (2018) analyzed 42 separate prospective and retrospective cohort studies with over 101 thousand individual participants diagnosed with schizophrenia, who were either prescribed LAIAs or oral medication. Individuals

prescribed LAIAs required hospitalization 15% less (rate ratio, .85; 95% CI .78-.93) than individuals prescribed oral medication over one year. Additionally, individuals prescribed LAIA had a 22% lower risk (risk ratio, .78; 95% CI .67-.91) of discontinuing their prescribed medication than individuals prescribed oral antipsychotics over one year (Kishimoto et al., 2018). As with all medication changes, LAIAs do have inherent risks, and therefore there is an appeal to initiating this medication while the patient is hospitalized to monitor for adverse reactions.

Literature Related to Telehealth. In response to the COVID-19 pandemic, there has been an increase in telehealth services. The benefits of this range of technology are far-reaching and new applications are continuing to develop. Various forms of telehealth technologies have demonstrated value in decreasing both unintentional and intentional medication nonadherence.

Research has shown that the majority of 558 surveyed patients with SSD found text messages or application reminders about medication adherence useful and easy to use (Kannistso et al., 2015). A randomized control trial of individuals with SSD prescribed antipsychotics residing in the community and requiring outpatient care demonstrated possible benefits of telehealth services. In 2017, researchers (Xu et al., 2019) compared 123 patients taught to use a telehealth application that provided medication reminders, symptom tracking, general health education, and streamlined communication healthcare professionals to 123 individuals in a control group. At the end of the six-month study, 61% of the experimental group was adherent to their antipsychotics compared to 48% of the control group: a 27% improvement (95% CI .03-.22). Additionally, only 7.3% of interventional participants required hospitalization compared to 20.5% of control participants (relative risk, .36; 95% CI .17-.73; Xu et al., 2019). A similar study investigated the benefit of educating patients on using a telehealth mobile application before

being discharged from an inpatient behavioral health unit. In this study, 42 individuals with SSD who had previous access to a smartphone were taught to use a mobile health application compared to 42 individuals provided with written discharge education. After six-months, the experimental group was 28% more likely to be adherent to their prescribed antipsychotics than the control group (Zhu et al., 2020). This study demonstrates the potential for identifying hospitalized patients with smartphones and educating them to utilize telehealth services to promote antipsychotic adherence once discharged to outpatient care. This education could help address the gap observed in a 2018 survey of 113 outpatients with SSD. In the study by Torous et al. (2018), 66% of surveyed outpatients reported owning smartphones. However, of the 77 individuals with smartphones, only 10% of individuals reported using mental health applications (Torous et al., 2018).

Organizational Project Information

The adult behavioral health unit (ABHU) is a locked 38-bed unit that provides a therapeutic environment for observing, evaluating, diagnosing, and treating mental health disorders, such as SSD. The ABHU predominantly serves patients from northern Minnesota, Wisconsin, and North Dakota and has a regional service area of a population of 460,000. Permission was obtained through the facilities institutional review board, which oversee QI efforts and manages the facility's human research protection program.

Interprofessional Team and Stakeholders

The Institute for Health Improvement (IHI; 2017), describes four essential QI team roles. The clinical nurse supervisor of the ABHU served as the project sponsor based on their role with QI initiatives on the unit. The ABHU nursing manager and the current medical director of the ABHU served as a clinical leaders based on their authority to implement changes to unit policies

and procedures. With their administrative and managerial positions, the nursing manager and medical director facilitated interprofessional collaboration between technical experts and stakeholders. Technical experts in the area of information technology and members of the nurse practice council contributed to the QI initiative with their knowledge of the organization's technical abilities and processes of care. Lastly, a psychiatric mental health nurse practitioner student served as the subject matter expert and primary facilitator for the initiative (IHI, 2017). Additional stakeholders for the QI project were patients' family members or guardians, behavioral health technicians, occupational therapists, pharmacists, social workers, case managers, and external to unit mental health and primary care providers.

Participants

Staff-participants. Candidates eligible for the QI project initiative were the 55 registered nurses that worked on the ABHU. Inclusion for staff-participants were the nurses who primarily worked on the unit and nurses who were in the behavioral health float pool RNs. Exclusion for staff-participants were additional behavioral health staff, behavioral health technicians, occupational therapists (OTs), physical therapists (PTs), certified nursing assistants, travel nurses, casual employees, and medical-surgical float pool nurses.

Patient-participants. Candidates eligible for the QI project initiative were patients admitted to the ABHU. Inclusion criteria for patient-participants were individuals age 18 years or older with a diagnosis of SSD who were prescribed an oral antipsychotic medication prior to admission. Exclusion criteria included patients below the age of 18 and patients with SSD who were not previously prescribed antipsychotics.

Needs Assessment and Gap Analysis

At the time the QI project, the ABHU employed three psychiatrists, 55 registered nurses, 45 behavioral health technicians, six nursing assistants, two recreational therapists, two chemical dependency counselors, three family therapists, three social workers, and three OTs, and two health unit coordinators.

Before admission to the ABHU, patients complete a psychiatric assessment with a psychiatric consult clinician in the emergency department or other inpatient unit to determine if the patient meets the admission criteria. Additionally, patients complete an admission nursing assessment with a RN before meeting with their psychiatric provider. To evaluate aspects of their behavioral health, screening assessments are completed using standardized tools: the Colombia Suicide Severity Rating Scale to assess their suicidality, the Broset Violence Checklist to assess their risk of violence, and hospital-specific drug and alcohol use assessment tool. Social workers are assigned to all patients, though their patient interactions are based on need as indicated by the psychiatric provider or initial RN assessment. OTs were also available to patients but, before this QI project implementation, a provider order or consult was required.

Before the QI project implementation, the unit did not assess patients' medication adherence or have a structured policy to guide staff on responding to nonadherence. Patients were asked what medication they were prescribed and when the last time they took the medication. Patients were not asked about medication adherence, compliance, frequency of missed doses, side effects, or attitudes regarding their medication regiment. Furthermore, unit staff did not routinely evaluate if patients utilized the adherence promoting telehealth technology used by the facility. Lastly, the nurses at the ABHU had not received in-person training to assist patients to register for the telehealth technology, despite having access to facility education

material on the topic. Therefore, there was a clear organizational need to educate nurses on conducting a standardized adherence assessment and provide nurses with in person education on educating patients to utilize telehealth while hospitalized.

Strengths, Weaknesses, Opportunities, and Threats Analysis

The ABHU had multiple strengths that contributed to the successful QI initiative. First, ABHU management and administrative staff supported external QI projects, such as this initiative, by lending time, expertise, staff, certain supplies, and facilities. One weakness of the organization was that it could not directly manage low-performing or resistant individual employees in real time. A second weakness is that education and QI initiatives could be challenging to implement due to the number of employees and variability in schedules. An opportunity was that the unit nurse practice council has supported the QI initiative by agreeing to reinforce education conducted by the primary facilitator. Another opportunity was the facility already had prepared, albeit unutilized, education material for staff on available adherence promoting interventions Two potential threats to the QI initiative were disinterested staff who disregard the education and the external threat of COVID-19, which took staff priority over other QI initiative time and resources.

Guiding Theoretical Framework and Change Theory

To initiate or add a structure to the QI process, project facilitators used the plan-do-study-act (PDSA) cycle QI model. The first step, "plan," identified an area of potential improvement and the key stakeholders, clarified goals and objectives, and formulated an intervention (Johnson & Sollectico, 2020). For this QI initiative, the attending psychiatrist and medical director at the ABHU identified the primary goal of this initiative to educate nurses in the use of the standardized assessment tool to quantify or qualify patient oral antipsychotic medication

adherence. In the second PDSA cycle step, “do”, the primary facilitator prepared and provided the 55 ABHU RNs with an educational session about the use of the MARS, basic concepts of LAIA medication, and how to educate patients to utilize facility specific telehealth technologies. In the following third PDSA step, “study”, facilitators observed and assessed the intervention and its impact on the participants and stakeholders. In the fourth step of the PDSA cycle, “acting”, facilitators reviewed the previous steps and evaluated if the original objective was met, determined if any significant conclusions could be drawn, and discussed if any changes are warranted. In the continuous PDSA cycle, this final stage carried over into the following PDSA cycle repetition conducted by the facility nurse practice council that made the QI initiative a sustainable effort within the organization.

The therapies and approach utilized at the ABHU were based on the Theory of Illness Management and Recovery (IMR) framework. IMR is a program that uses evidence-based-practices to provide patients and their caregivers with the knowledge, skills, strategies, and resources to cope with their mental illness to maintain and achieve patient-specific recovery goals. The IMR framework encompasses cognitive behavioral therapy practices that uses bio-psycho-social interventions to identify and respond to the cognitive processes, emotions, and behaviors that are associated with both adaptive and mal-adaptive coping strategies (Polat & Kutlu, 2021).

Goal and Objectives Clarified

This QI project’s goal was to improve antipsychotic medication adherence by implementing the addition of a medication adherence assessment tool to guide nurses to identify candidates who may benefit from adherence promoting interventions on the ABHU. The project's aim was to improve patient outcomes through increased medication adherence.

Objective One

By the end of the first month of the QI project, project facilitators would develop an educational module for staff participants.

Implementation

Facilitators created an electronically available handout that supplemented the verbal education session. This educational material compiled and condensed information from evidence-based sources utilized in this paper. Facilitators incorporated multiple education modalities (written, verbal, and visual) within their educational strategy to increase retained knowledge. Dickerson and Graebe (2020) reported that virtual or electronic-based small group education is becoming a pillar of in-hospital nursing education in light of the COVID-19 pandemic. By preemptively distributing education resources digitally before an educational session, educators can reduce unnecessary COVID exposure (Dickerson & Graebe, 2020). Additionally, the written and visual handout provided education recipients with a reference tool at their post education session. A copy of this handout is available in Appendix-A, Figure-1.

Outcome Measure and Data Analysis

The outcome measure for the development of the educational module was narrative and was evaluated as met or not met. Additionally, the interprofessional team served as a *focus group* to provide instant feedback to refine the educational module before staff-participants received the education (Issel & Wells, 2018).

Objective Two

By the end of the 2nd month, 90% of ABHU nurses would receive the education module.

Implementation

First, project facilitators emailed electronic education material to staff participants. The verbal educational module occurred during the "staff huddles" that take place every day and evening during shift-change for two weeks. The education was completed in a 15-minute period: 10 minutes of education and 5 minutes of demonstration and question answering. The education took place during business days (Monday-Friday), and excluded weekends (Saturday and Sunday). After the first two weeks, staff who did not received the education session were identified and sought out and educated informally on a one-to-one basis. The educational module covered information on how to complete an adherence assessment and its use in guiding intervention selection. Additionally, the module provided refresher information on LAIA medication and how to educate and assist patients on establishing and accessing a facility specific telehealth technology: both topics are already within the scope of knowledge of 55 nurses who work on the ABHU**.**

Outcome Measure and Data Analysis

The data source was an attendance roster that the staff read and signed. The sample was the 55 registered nurses on the ABHU. The evaluation included the percentage of total staff who received the educational module (Issel & Wells, 2018).

Objective Three

By the end of the 3nd month, nurses would offer or complete the MARS adherence assessment with 90% of eligible patient participants.

Implementation

A paper copy of the adherence assessment tool was provided to staff which they offered/completed with admitted patients with SSD prescribed antipsychotics. The paper copy

was placed in an ‘admission packet’ with several other documents that the nurses review and complete with all patients during the admission process. Throughout the trial, the health unit coordinators and charge nurse reminded nurses to complete this assessment with newly admitted patients. After the patient completed the form, the RN collected it from the patients.

Outcome Measure and Data Analysis

The data source included the RNs and the patient participants admitted to the ABHU. The sample was the total patients who were offered or completed the self-report assessment tool. The evaluation included the percentage of total nurses who offered or completed the assessment tool with patients with SSD diagnosis compared to the total patients admitted with an SSD diagnosis. Additionally, facilitators recorded qualitative feedback if a patient-participant did no complete the assessment tool (e.g., the patient refused, patient unable to complete, or staff forgot to complete the assessment) to be reviewed by facilitators (Issel & Wells, 2018).

Objective Four

By the end of the 3nd month, 90% of patient MARS results were communicated to the provider.

Implementation

RNs recorded the assessment results in the electronic healthcare records system (EHR) in a written progress note. In instances that patients refused the assessment, RNs documented the refusal. Additionally, the score or refusal was placed in the electronic, ‘sticky note’ visible to the admitting provider.

Self-reporting adherence assessment tools have demonstrated to be effective means to identify candidates for adherence-promoting interventions. For this QI project, the MARS score served as a clinical guideline to supplement healthcare professionals to consider when

formulating a treatment plan for the patient based on their adherence assessment (Appendix A, Figure 3). For individuals with scores indicating moderate/high risk of potential nonadherence (0-8), patients were offered telehealth education in addition to provider notification. For individuals with a MARS score indicating a low risk of nonadherence (9-10), no intervention would be required; however, the telehealth educational session was offered upon patient request.

Outcome Measure and Data Analysis

The data source for this included the registered nurses and patient-participants admitted to the ABHU who completed the MARS assessment. The sample was the total patients with SSD who completed the self-report assessment tool. The evaluation included the percentage of patient-participants whose providers were notified of the MARS results. Additionally, facilitators recorded qualitative feedback in the event a patient-participant did not receive the indicated intervention (e.g., the patient refused, the patient discharged, staff failed to complete the education; Issel & Wells, 2018).

Gantt Chart and Logic Model

The project timeline is present in a Gantt chart located in Appendix-A, Table-1. During the first month of the QI project (November 2021), project facilitators developed an educational module for participant staff. During the second month of the QI project (December 2021), 90% of ABHU nurses will receive the education module. During the third month of the QI project (January 2022), participant-staff completed the MARS adherence assessment with 90% consenting participant-patients diagnosed with SSD-prescribed antipsychotics. Additionally, during this time, 90% of participant-patients will be offered the corresponding intervention by nursing staff based on their MARS scores. During the fifth month (March 2022), the interprofessional team reconvened to condense and analyze the available quantitative and

qualitative data. A logic model noting the significant project assumptions, inputs, activities, outputs, immediate outcomes, and long-term outcomes of this project is located in Appendix-A, Table-2.

Budget

In the interest of stewardship of resources, the facility limited student projects to those that do not require additions to their electronic healthcare systems (EHS; e.g., adding the MARS assessment to a patient flowsheet within the EHS). Therefore, RNs were provided with a paper copy of the MARS assessment tools in the admission packet that is reviewed with all newly admitted patients. Registered nurses completed the MARS assessment with the patients during the admission process and placed the completed assessment in their paper chart. Additionally, registered nurses recorded the scores digitally within the EHS admission progress note and a 'sticky note' to providers.

The education material was printed and purchased by the primary facilitator. In total, 75 copies of the education material handout were created at a cost of twenty-five dollars. The facility management where the quality improvement project was completed agreed to print 150 copies of the MARS assessment.

Methodology and Analysis

Pre-implementation

The pre-implementation phase broadly aligned with the project's first objective: by the end of the first month of the QI project, project facilitators will develop an educational module for participant-staff. Facilitators provided an educational presentation to ABHU health care providers and unit management to introduce the project and receive feedback. Next, facilitators created an electronically available handout to supplement the forthcoming verbal education

session provided to registered nursing staff. This educational handout was also available in a printed version during the educational session. Utilizing multiple education modalities (verbal and visual) an effective educational strategy can increase retained knowledge and provide education recipients with a reference tool after the verbal education session (Dickerson & Graebe, 2020).

Implementation

The implementation phase aligned with the project's second objective: by the end of the second month of the QI project, 90% of ABHU nurses will receive the education module. First, project facilitators emailed electronic education material to staff-participants. The verbal educational module occurred during the "staff huddles" that happened every day and evening during shift-change for two weeks. These staff huddles on the ABHU serve as a time to introduce and reinforce educational developments with the staff. These small group educational sessions are also ideal for reducing COVID-19 and/or influenzas exposure by reducing unnecessary large group assemblies (Dickerson & Graebe, 2020). After that point, staff who had not received the education session were identified and sought out and educated informally on a one-to-one basis. The educational module covered information on how to complete the MARS adherence assessment and its use in an intervention selection. Additionally, the module provided refresher information on LAIA medication and how to educate and assist patients on establishing and accessing facility specific telehealth technology: both topics are already within the scope of knowledge of 55 nurses who work on the ABHU.

Post-Implementation

The post-implementation phase aligned with the third and fourth project goals: by the end of the third month of the QI project, participant-staff would complete the MARS adherence

assessment with 90% of individuals (participant-patients) diagnosed with SSD-prescribed antipsychotics, and 90% of those scores were communicated to the medical provider. This straightforward data collection process utilized a staff roster and chart audits conducted by the principal researcher. Data was collected and analyzed using Microsoft Excel.

Institutional Review Board/Ethical Considerations

This study is a quality improvement project that utilized evidence to improve practices related to identifying candidates for adherence-promoting interventions. The project proposal was submitted to the College of St. Scholastica and the host agency's institutional review boards (IRB) and approval was obtained from both facilities. The project, was done with the support of the partner agency's QI efforts, followed unit leadership's practices of implementing evidence-based practices to improve the quality of care. Therefore, staff participants were considered to have rendered implied consent to participate in this QI project. Participant confidentially was maintained by keeping all records with participant identifiers in either a locked drawer within the nurse management offices or on a password-protected electronic health records system used at the agency. These security measures ensured that staff and patient participant data was protected according to Health Insurance Portability and Accountability Act. Additionally, the initiative adhered to American Nursing Association (ANA) and the Office for Human Research Protections regulations for the protections of human subjects in research (ANA, 2015). Patient-participants refusal to participate in either the assessment or intervention will not impact other aspects of their quality of care.

Implementation

Project implementation began after both institutions accepted the IRB application. The project timeline (Gantt chart in Appendix-A, Table-1) was closely followed. However, there

were slight modifications. Twice a day, staff-participate education took place during business days of the final two weeks of the December 2021 calendar year. Only one education session took place on Friday, December 24th (Christmas Eve) During the 31-day trial period (January 2022), the primary facilitator visited the unit daily to provide assistance during the opening days of the trial. Chart audits were completed every day of the first week (Jan 1st-7th), followed by chart audits Monday, Wednesday, Friday for the remaining duration of the month.

A notable late addition to the original QI project initiative was that the unit's medical director requested that the MARS assessment be offered to all admitted patients, regardless of diagnosis and prior to admission prescriptions. Therefore, staff attempted to offer or complete the MARS assessment to patients without SSD or prescription to antipsychotics. Facilitators collected this information data for analysis. However, this information data was excluded when evaluating the QI project objectives.

Results from Data Collection

Patients with SSD prescribed Antipsychotics

Data collection and analysis was completed for QI project objectives two, three, and four. 51 of the 55 nurses (93%) received the verbal education session. Regarding the four nurses who did not receive the verbal education, two were on maternity leave, and two were on leave related to COVID-19. Forty-five patients with SSD prescribed antipsychotics were admitted during the trial period. RNs completed the MARS tool with 29 patients (64%). Twelve patients (26%) refused the MARS assessment when offered by the RN staff. One patient (2%) was offered the MARS assessment but could not respond due to catatonia attributed to their SSD. Nurses forgot to provide the assessment to 4 patients (8%). Therefore, collectively nurses completed or offered the assessment to 92% of patients with SSD prescribed antipsychotics.

The health unit coordinator ensured communication of patient MARS assessment results or refusal to the patient's psychiatric provider. However, MARS results were not communicated when nurses forgot/failed to offer the assessment. Therefore, RNs communicated 92% of patients' MARS scores or refusals to their health care provider. A table of this information is presented below.

Patients with SSD: Assessment and Communication Completion

	Number of patients	Percent of total patients
Total completed assessments	29	64%
Total refused assessments	12	26%
Total assessments patients unable to Respond	1	2%
Total forgotten assessments	4	8%
Total assessments offered (completed, offered, and refused)	41	92%
Total patients	45	

Twenty four of the 29 patients (83%) who completed the MARS assessment obtained scores indicating possible nonadherence (8 ≥ score). RN staff then offered telehealth education to all patients. Eleven of the 24 patients with MARS scores indicating nonadherence accepted education on facility-specific telehealth technologies. Additionally, two patients who had refused the MARS assessment accepted education regarding facility-specific telehealth technologies. A table containing this information is presented below.

Patients with SSD: MARS Scores

		Percent of total completed assessments (if applicable)
Mean score of completed assessments	6.72	N/A
Number of patients with MARS score (8 ≥ score)	24	83%
Patients with scores (8 ≥ score) who accepted education / patients with scores (8 ≥ score)	11	46%
Patients who refused assessment upon admission who accepted education	2	N/A
Total completed assessments	29	

Fourteen of the 45 admitted patients (31%) with SSD had telehealth accounts with the healthcare facility prior to admission. Thirty One of the 45 patients (69%) did not have telehealth accounts before admission. Throughout the trial, RNs assisted 13 patients (29%) in creating telehealth accounts while hospitalized and provided telehealth education. Additionally, psychiatric providers prescribed two LAIAs to two patients whose MARS assessment scores indicated possible nonadherence.

Patients with SSD: Interventions Based on MARS Score

		Percent of Total Patients
Total patients with telehealth at admission	14	31%
Total patients without telehealth at admission	31	69%
Total patients who accepted education during hospitalization	13	29%
Total patients with telehealth at discharge	27	60%
Patients prescribed LAIAs during hospitalization	2	4%
Total Patients	45	

Patients without SSD

In total, 55 patients without SSD were admitted during the trial period. RNs completed the MARS tool with 45 patients (82%). Two patients (4%) refused the MARS assessment when offered by RN staff. One patient (2%) was offered the MARS assessment but could not respond due to severe non-verbal autism. Nurses forgot to provide an assessment to 7 patients (13%). Therefore, collectively nurses completed or offered the assessment to 87% of patients prescribed antipsychotics without SSD. Paralleling the results of MARS assessment among patients with SSD prescribed antipsychotics, 87% of patients' MARS scores or refusal as communicated to the health care provider. A table of this information is presented on the next page.

Patients without SSD: Assessment Completion and Communication		
	Number of Patients	Percent of total Patients
Total completed assessments	45	82%
Total refused assessments	2	4%
Total assessments patients unable to respond	1	2%
Total forgotten assessments	7	13%
Total assessments offered (completed, offered, and refused)	48	87%
Total Patients	55	

Twenty eight of the 45 patients (58%) who were offered the MARS assessment obtained scores indicating possible nonadherence (8 ≥ score). RN staff then offered telehealth education to all patients. Seven of the 28 patients with MARS scores indicating nonadherence accepted education regarding facility-specific telehealth technologies. Five patients whose MARS score did not indicate possible nonadherence (8 ≤ Score) accepted education regarding facility-specific telehealth technologies. Finally, two patients who had refused the MARS assessment accepted education regarding facility-specific telehealth technologies.

Patients without SSD: MARS Scores		
		Percent (if applicable)
Mean score of completed assessments	7.24	N/A
Number of patients MARS score (8 ≥ score)	26	58%
Patients with scores (8 ≥ score) who accepted education / patients with scores (8 ≥ score)	7	27%
Patients with scores (8 ≤ score) who accepted education	5	
Patients who refused assessment upon admission who accepted education	2	N/A
Total completed assessments	45	

Prior to admission, 27 of the 55 admitted patients (49%) without SSD had telehealth accounts with the healthcare facility. Twenty eight of the 55 patients (51%) did not have

telehealth accounts before admission. Throughout the trial, RNs assisted 14 patients (25%) in creating telehealth accounts while hospitalized and providing telehealth education.

Patients without SSD: Interventions Based on MARS Score		
		Percent of Total Patients
Total patients with telehealth at admission	27	49%
Total patients without telehealth at admission	28	51%
Total patients who accepted education during hospitalization	14	25%
Total patients with telehealth at discharge	41	75%
Total Patients	55	

Discussion of Data/Outcome Interpretation

Revisiting the QI objectives**,** data analysis confirmed that all QI project objectives were successfully accomplished. Project facilitators developed an evidence-based education module, and it was delivered to over 90% of RNs. During the 31-day trial period, RNs successfully offered the assessment and communicated the results or refusal of 92% of patients with SSD prescribed antipsychotics admitted to the unit healthcare providers. The two HUCs became vital to project success and ensured that admitting RNs completed and communicated patient completion or refusal of the MARS assessment to their healthcare provider.

The QI project also successfully increased the use of antipsychotic adherence promoting interventions by the healthcare team. In a retrospective review of the previous month's intervention utilization, the agency's healthcare team provided zero patients with telehealth education and only prescribed one patient a LAIA. In contrast, during the 31-day trial, the healthcare team assisted 13 patients with SSD prescribed antipsychotics to establish telehealth accounts and prescribed two patients LAIAs. Additionally, RNs assisted 14 patients without SSD in establishing telehealth accounts during the trial. Lastly, during the trial period, the ABHU

medical director and unit administration changed the previous policy to have OTs evaluate and treat all newly admitted patients to the unit. The medical director and OT manager mentioned that this QI project contributed to this decision based on the high rates of nonadherence among all admitted patients. However, they specified that it was not the sole factor in having OTs screen and treat all patients.

Challenges and Limitations

The first significant challenge of this implementation process was ensuring that registered nurses completed the MARS assessment, documented the score electronically, or documented the reason for non-completion. The second significant challenge was insuring nurses educated patients on the agency's telehealth technology patients when indicated. One minor challenge was ensuring that registered nurses received the education session during the second month.

One limitation to this study was the lack of qualitative or quantitative feedback from RNs regarding their experience regarding the MARS tool and the education module. For instance, the use of a five-point Likert scale survey tool among RNs could have provided interesting results on the impact of the QI project.

Dissemination

Project facilitators and stakeholders reconvened after the completion of the QI project trial period. Facilitators reviewed preliminary results with council members at the first nurse practice council meeting following the conclusion of the 31-day QI project trial. At the subsequent meeting, the primary facilitators provided a 15-minute doctor of nursing practice poster presentation on the final project results. A digital poster was created and can be found in Appendix-A, Figure-4. Following the oral presentation, project facilitators and the nurse practice council collectively decided to make the MARS assessment a permanent addition to the unit's

admission process. Additionally, this scholarly paper was submitted to a Doctoral Project Repository and the digital poster was submitted to the poster repository.

Conclusion

Nonadherence to antipsychotics is a well-known challenge for individuals with schizophrenia spectrum disorders (SSD). The issue of nonadherence is acutely present in inpatients environments such as the adult behavioral health unit. To address antipsychotic nonadherence, this quality improvement project introduced an evidence-based means to evaluate antipsychotic adherence of individuals with SSD admitted to the unit and used this score to identify candidates for evidence-based adherence-promoting interventions. This quality improvement project demonstrated the techniques of selecting and implementing such an assessment tool and the value it can add in improving subsequent adherence and overall quality of care among individuals with SSD.

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Appendix A

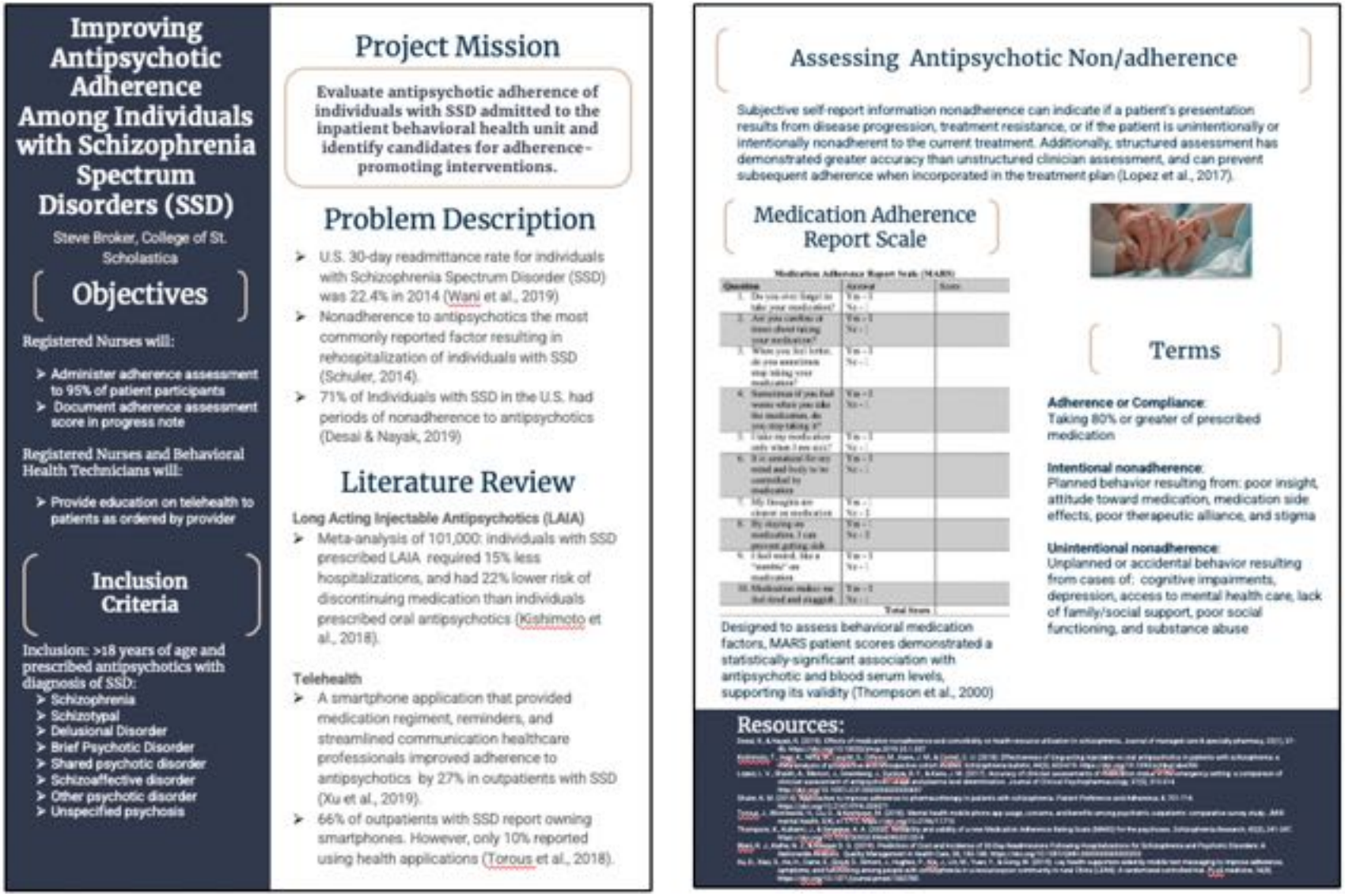

Figure 1

Medication Adherence Report Scale (MARS)		
Question	Answer	Score
1. Do you ever forget to take your medication?	Yes - 0 No - 1	
2. Are you careless at times about taking your medication?	Yes - 0 No - 1	
3. When you feel better, do you sometimes stop taking your medication?	Yes - 0 No - 1	
4. Sometimes if you feel worse when you take the medication, do you stop taking it?	Yes - 0 No - 1	
5. I take my medication only when I am sick?	Yes - 0 No - 1	
6. It is unnatural for my mind and body to be controlled by medication	Yes - 0 No - 1	
7. My thoughts are clearer on medication	Yes - 1 No - 0	
8. By staying on medication, I can prevent getting sick	Yes - 1 No - 0	
9. I feel weird, like a “zombie” on medication	Yes - 0 No - 1	
10. Medication makes me feel tired and sluggish	Yes - 0 No - 1	
	Total Score	

Figure 2

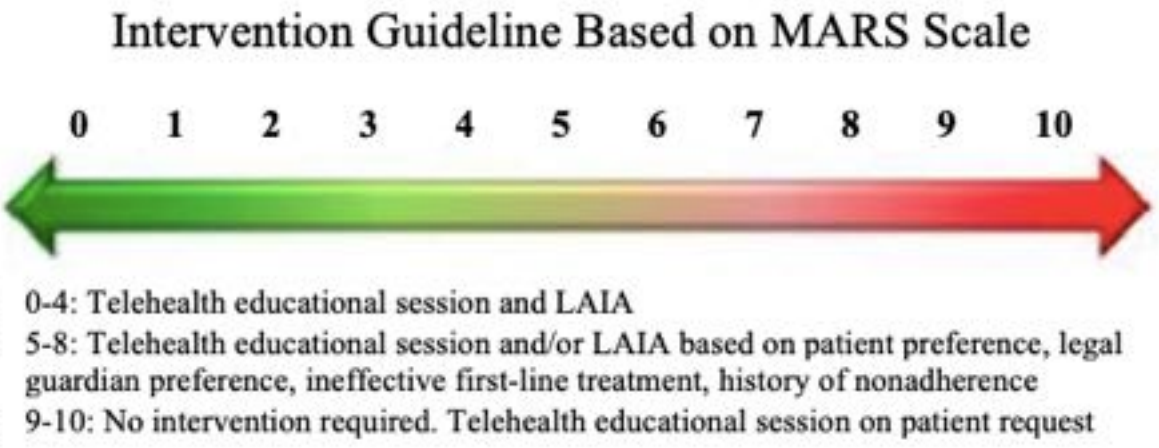

Figure 3

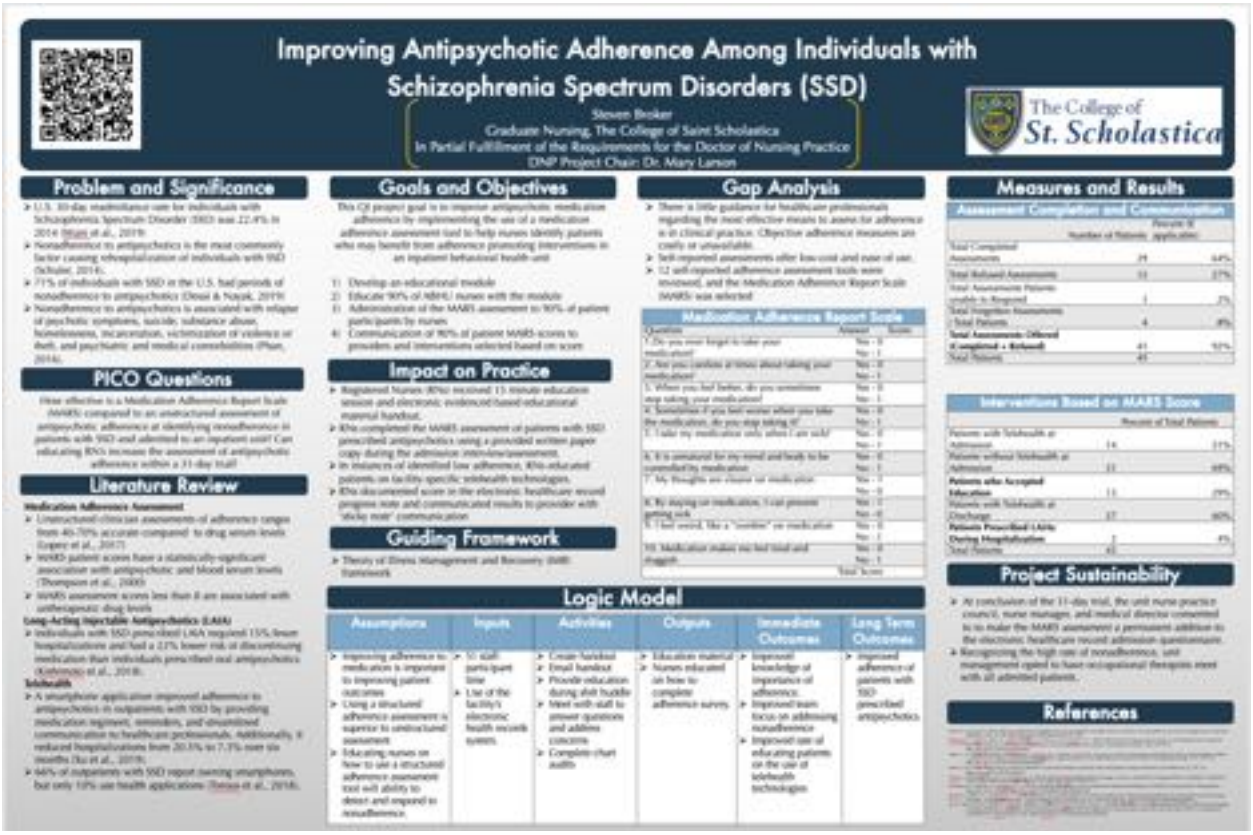

Figure 4

Timeline – Gantt Chart						
Objective	October 2021	November 2021	December 2021	January 2022	February 2022	March 2022
Objective 1: Develop education module						
Application for IRB approval at St. Scholastica and Essentia Health						
Objective 2: ABHU nurses receive education module						
Objective 3: Nurses administer MARS assessment						
Objective 4: Nurses communicate MARS score to provider						
Data analysis and presentation to stakeholders						

Table 1

Logic Model for Improving Antipsychotic Adherence Among Individuals with Schizophrenia Spectrum Disorders Admitted to an Inpatient Psychiatric Unit: A Quality Improvement Project					
Assumptions	**Inputs**	**Activities**	**Outputs**	**Immediate Outcomes**	**Long Term Outcomes**
Improving medication adherence improves patient outcomes Structured adherence assessment is superior to unstructured assessment Educating nurses to use a structured adherence assessment tool improves providers' detection and response to nonadherence	Staff-participant time Use of facilities health electronic records system.	Create and email handout Provide education during shift huddle Meet with staff to answer questions and address concerns Complete chart audits	Education material Nurses educated on completing adherence survey.	Improved knowledge of adherence importance. Improved team focus on addressing nonadherence Improved rate of patient education on the use of telehealth technologies	Improved adherence of patients with SSD prescribed antipsychotics

Table 2

Appendix B

Literature Matrix Table

Reference	Purpose	Design	Sample	Intervention	Results	Notes
Bailey, M. K., Weiss, A. J., Barrett, M. L., & Jiang, H. J. (2019). Characteristics of 30-day all-cause hospital readmissions, 2010-2016. Statistical Brief# 248. Agency for Healthcare Research and Quality. https://www.hcup-us.ahrq.gov/reports/statbriefs/sb248-Hospital-Readmissions-2010-2016.jsp USA Level IV	To investigate the 30-day all cause hospital readmission rate in the USA	Retrospective Cohort	Yearly readmission info from AHRQ (e.g, 2016 – 4,280,500 samples)	N/A	30-day readmission rate in the U.S. among all diagnosis categories fell from 14.2% in 2010 to 13.9% in 2016	
Bianco, C. L., Myers, A. L., Smagula, S., & Fortuna, K. L. (2021). Can Smartphone Apps Assist People with Serious Mental Illness in Taking Medications as Prescribed?. *Sleep Medicine Clinics*, *16*(1), 213-222. https://doi.org/10.1016/j.jsmc.2020.10.010 USA and European Countries Level V	To explore the impacts of multiple smartphone application on medication adherence among individuals with serious mental illness	Systematic review	N/A	Smartphone applications that provided medication reminders and small general health education to individuals with SMI	Small pilot studies on various smartphone applications demonstrated a range of improvement on medication adherence from 5% to upwards of 25%	Small pilot studies, multiple with sample sizes under 25 participants
Brown, M. T., Bussell, J., Dutta, S., Davis, K., Strong, S., & Mathew, S. (2016). Medication adherence: truth and consequences. *The American Journal of the Medical Sciences*, 351(4), 387-399. https://doi.org/10.1016/j.amjms.2016.01.010 Level I	Explore research related to adherence rates among most commonly prescribed medication for chronic conditions and the socioeconomic impacts of nonadherence	Systematic review	N/A	N/A	Approximately 50% of individuals are non-adherent to prescribed medications to manage chronic conditions worldwide	
Castillo, E. G., & Stroup, T. S. (2015). Effectiveness of long-acting injectable antipsychotics: a clinical perspective. *Evidence-based mental health*, 18(2), 36-39. http://dx.doi.org/10.1136/eb-2015-102086 USA and UK Level II	Compare and contrast the effectiveness of both old and new long-acting injectable and oral antipsychotics	Systematic review of randomized control trials (RTCs), observational cohort studies, and qualitative studies	N/A	Oral antipsychotics or LAIA	Qualitative studies report superiority of LAIA with suspected non-adherence Newer LAIAs reduce episodes of new onset psychosis versus older LAIAs and oral medications	This article synthesizes information from a range of older meta-analysis and systematic reviews.

Chan, A. H. Y., Horne, R., Hankins, M., & Chisari, C. (2019). The medication adherence report scale: a measurement tool for eliciting patients' reports of nonadherence. *British journal of clinical pharmacology*, *86*(7), 1281-1288. https://doi.org/10.1111/bcp.14193 UK Level IV	Determine the validity and reliability of the Medication Adherence Report Scale (MARS) in patients prescribed medications for hypertension, diabetes, and asthma	Cross sectional study	Hypertension – (n=228) Asthma – (n=100) Diabetes – (n=100)	N/A	Hyper-tension Cronbach a coefficient - .68 Asthma Cronbach a coefficient .84 Diabetes Cronbach a coefficient .89	
De las Cuevas, C., & de Leon, J. (2020). Self-Report for Measuring and Predicting Medication Adherence: Experts' Experience in Predicting Adherence in Stable Psychiatric Outpatients and in Pharmacokinetics. Patient preference and adherence, 14, 1823-43. https://doi.org/10.2147/PPA.S242693 USA and European Countries Level I	The authors reviewed quantitively and qualitative of multiple medication adherence tools to explore their applicability in both research and clinical practice	Systematic Review	N/A	-Direct supervision -Blood plasma levels -Self reports -Physician perspective -Pill counts -Prescription refills -Patients clinical response -Electronic medication monitors	Direct supervision and blood plasma levels were most accurate at accessing adherence but are not widely available or applicable. Mixed methods (prescription refills & self-report) offer practicality and low cost in clinical use	
Desai, R., & Nayak, R. (2019). Effects of medication nonadherence and comorbidity on health resource utilization in schizophrenia. *Journal of managed care & specialty pharmacy*, *25*(1), 37-46. https://doi.org/10.18553/jmcp.2019.25.1.037 USA Level IV	To investigate the economic impacts of nonadherence to antipsychotic among individuals with SSD	Cross-sectional research study	1.2 million individuals with SSD in the U.S.	-Anti-psychotic adherence -Cost of care -Frequency of hospitalizations -Utilization of inpatient and outpatient resources	Non-adherence is associated with higher utilization of costly inpatient hospitalizations to manage both acute psychiatric and medical conditions	
Dickerson, P., & Graebe, J. (2020). Nursing continuing professional development—A paradigm shift. *The Journal of Continuing Education in Nursing*, *51*(7), 297-299. https://doi.org/10.3928/00220124-20200611-02 USA Level VII	To describe the impacts of COVID-19 on Nursing Education	Opinion of expert committee	N/A	N/A		Small groups & telehealth education is becoming pillar of education method during the era of COVID-19
Heeb, R. M., Kreuzberg, V., & Grossmann, V. (2019). Physicians' Assessment of Medication Adherence: A Systematic Review. *J Pharma Care Health Sys*, *6*(202),	To investigate research related to clinician assessments of medication	Systematic Review	N/A	-Physicians' perception of adherence -Blood plasma levels -Patients' self-	Physicians' perception alone of adherence significantly differed from patient reports, prescription refills, and blood plasma levels. In most cases	

2376-0419. https://doi.org/10.4172/2376-0419.1000202 USA Level I	adherence – 19 studies			reports of adherence -Prescription refills	physicians overestimated adherence by 10-50%	
Kannisto, K. A., Adams, C. E., Koivunen, M., Katajisto, J., & Välimäki, M. (2015). Feedback on SMS reminders to encourage adherence among patients taking antipsychotic medication: a cross-sectional survey nested within a randomized trial. *BMJ open*, *5*(11). http://dx.doi.org/10.1136/bmjopen-2015-008574 USA Level VI	To survey participants who were part of a larger research study for their opinion of SMS geared towards medication adherence	Cross sectional survey – qualitative study	558 individuals with SSD prescribed anti-psychotics	Pt received text messages reminders to take medications, refill prescriptions, and attend health care provider appointments	98% found SMS easy to use 72% were satisfied with reminders 61% found them useful Single patients living independently reported the highest satisfaction/usefulness.	Proof of concept with older technology without significant health care provider involvement after initial set up.
Kishimoto, T., Hagi, K., Nitta, M., Leucht, S., Olfson, M., Kane, J. M., & Correll, C. U. (2018). Effectiveness of long-acting injectable vs oral antipsychotics in patients with schizophrenia: a meta-analysis of prospective and retrospective cohort studies. *Schizophrenia bulletin*, 44(3), 603-619. https://doi.org/10.1093/schbul/sbx090 USA Level I	Compare and contrast the effectiveness of oral antipsychotics vs LAIA formations	Meta-analysis of prospective and retrospective cohort studies	101 thousand patients with SSD	Oral anti-psychotics or LAIA Adherence rates Rehospitalization	Patients prescribed LAIAs versus oral anti-psychotics required 15% fewer hospitalizations and had a 22% lower rate of dis-continuing their prescribed medication.	
Lam, W. Y., & Fresco, P. (2015). Medication adherence measures: an overview. *BioMed Research International*, *2015,* 1-12. https://doi.org/10.1155/2015/217047 USA and European Countries Level IV	Compare and contrast the effective of different available means of assessing for adherence	Systematic review of RCTs and prospective and retrospective cohort studies	N/A	N/A		Review of various studies comparing objective versus subjective means of assessing adherence
Lopez, L. V., Shaikh, A., Merson, J., Greenberg, J., Suckow, R. F., & Kane, J. M. (2017). Accuracy of clinician assessments of medication status in the emergency setting: a comparison of clinician assessment of antipsychotic usage and plasma level determination. *Journal of clinical psychopharmacology*, *37*(3), 310-314. http://doi.org/10.1097/JCP.0000000000000697 -USA Level IV	To determine the accuracy of clinicians' assessments on if their patients' antipsychotic serum levels were within normal level in an acute emergency setting.	Correlation cohort study	97 patients Un-reported number of psychiatrists	N/A	Emergency room staff assessment of medication status predicted therapeutic anti-psychotic levels at rates of 41.5% rate.	

Park, E. J., Amatya, S., Kim, M. S., Park, J. H., Seol, E., Lee, H., ... & Na, D. H. (2013). Long-acting injectable formulations of antipsychotic drugs for the treatment of schizophrenia. *Archives of pharmacal research*, 36(6), 651-659. https://doi.org/10.1007/s12272-013-0105-7 Level VII	Literature review describing pharmacology and pharmakinetics principles of long-acting antipsychotic information	N/A	N/A	N/A	N/A	Similar to textbook
Phan, S. V. (2016). Medication adherence in patients with schizophrenia. *The International Journal of Psychiatry in Medicine*, *51*(2), 211-219. https://doi.org/10.1177%2F0091217416636601 USA Level I	To investigate the health and socioeconomic implications of nonadherence to antipsychotic among individuals with SSD	Systematic review of prospective and retrospective cohort studies, RCTs, cross sectional studies	N/A	N/A	Nonadherence was associated with increased hospitalization rates, exacerbation or relapse of psychotic symptoms, substance abuse, homelessness, suicide, incarceration, victimization of violence or theft, and psychiatric and medical comorbidities	
Polat, S., & Kutlu, Y. (2021). The effectiveness of illness management and recovery program in patients with schizophrenia. *Archives of Psychiatric Nursing*, *35*(2), 162-167. https://doi.org/10.1016/j.apnu.2021.01.004 USA Level III	Determine the impact of the illness management and recovery program in patients with SSD	RCT	50 patients 25-experimental 25 – control	Intervention group participated in 10 modules and 20 sessions of Illness Management and Recovery Program. Control group had one assessment interview	Participants of intervention group had significantly higher Social Functioning Scale Patient (SFSP) scores than control group	
Sajatovic, M., Levin, J., Ramirez, L. F., Hahn, D. Y., Tatsuoka, C., Bialko, C. S., ... & Williams, T. D. (2013). A prospective trial of customized adherence enhancement plus long-acting injectable antipsychotic medication in homeless or recently homeless individuals with schizophrenia or schizoaffective disorder. *The Journal of clinical psychiatry*, 74(12), 1249. https://doi.org/10.4088/JCP.12m08331 USA Level IV	Determine the impact of LAIA medication and an educational program among homeless or recently homeless individuals who struggle with SSD and nonadherence	Prospective cohort study	N= 30	LAIA medication and a once monthly educational session about medication adherence and healthcare literacy.	Medication non-adherence decreased from 46% to 10% over the six-month study. Psychiatric symptoms and level of functioning improved significantly	
Shuler, K. M. (2014). Approaches to improve adherence to pharmacotherapy in patients with schizophrenia. Patient Preference and Adherence, 8, 701-714. https://doi.org/10.2147/PPA.S59371	To analyze various approaches to address adherence among patients with SSD. Review	Systematic review of prospective and retrospective	N/A	N/A	Anti-psychotic nonadherence is the most common contributing factor associated with readmission of patients with SSD	

USA Level I	factors associated with adherence, nonadherence.	cohort studies, RCTs, and cross-sectional studies				
Thompson, K., Kulkarni, J., & Sergejew, A. A. (2000). Reliability and validity of a new Medication Adherence Rating Scale (MARS) for the psychoses. *Schizophrenia research*, *42*(3), 241-247. https://doi.org/10.1016/S0920-9964(99)00130-9 USA Level IV	To determine the accuracy of reliability and validly of the MARS assessment tool	Prospective cohort study	N = 66	N/A	Cronbach's alpha of .75 Significant association between MARS scores and drug serum levels (P<.05)	Seminal/ classic study which merits inclusion despite publishing date.
Torous, J., Wisniewski, H., Liu, G., & Keshavan, M. (2018). Mental health mobile phone app usage, concerns, and benefits among psychiatric outpatients: comparative survey study. *JMIR mental health*, *5*(4), e11715. https://doi.org/10.2196/11715 USA Level IV	To investigate the use of smartphones among outpatients with SSD	Comparative Survey	N=113	N/A	66% of individuals reported owning a smartphone. Of individuals with smartphone, only 10% reported using mental health applications	
Velligan, D. I., Sajatovic, M., Hatch, A., Kramata, P., & Docherty, J. P. (2017). Why do psychiatric patients stop antipsychotic medication? A systematic review of reasons for nonadherence to medication in patients with serious mental illness. *Patient preference and adherence*, *11*, 449. https://doi.org/10.2147/PPA.S124658 USA Level I	Investigating qualitative factors associated with antipsychotic nonadherence	Meta-analysis of prospective cohort and cross-sectional studies	36 studies totaling 26336 participants	N/A	Poor insight (55%), substance abuse (36.1%), attitude towards medication (30.5%), medication side effects (27.8%), cognitive impairments (13.4%)	
Wani, R. J., Kathe, N. J., & Klesper D. G. (2019). Predictors of Cost and Incidence of 30-Day Readmissions Following Hospitalizations for Schizophrenia and Psychotic Disorders: A Nationwide Analysis. *Quality Management in Health Care*, *28*, 130-138. https://doi.org/10.1097/QMH.0000000000000223 -USA Level IV	To investigate the readmission rate of individuals with SSD from an inpatient behavioral health unit from January 1 2014 to November 30 2014	Prospective cohort study	343579 hospital discharges of individual with SSD	N/A	77625 individuals with SSD were readmitted to an inpatient behavioral health unit within 30 days. This was 22% of the total discharges.	

Xu, D., Xiao, S., He, H., Caine, E., Gloyd, S., Simoni, J., Hughes, P., Nie, J., Lin, M., Yuan, Y., & Gong, W. (2019). Lay health supporters aided by mobile text messaging to improve adherence, symptoms, and functioning among people with schizophrenia in a resource-poor community in rural China (LEAN): A randomized controlled trial. *PLoS medicine*, *16*(4). https://doi.org/10.1371/journal.pmed.1002785 -China Level III	Investigating the impact of a telehealth intervention on medication adherence	RTC	278 outpatient individuals, residing independently or with family members diagnosed with an SSD	Mobile text messages to remind patients to take medication. Weekly phone calls to assess current symptoms, functioning, and provide generalized education on health and wellness	Medication adherence was 0.61 in the experimental group and 0.48 in the control group	
Zhu, X., Li, M., Liu, P., Chang, R., Wang, Q., & Liu, J. (2020). A mobile health application-based strategy for enhancing adherence to antipsychotic medication in schizophrenia. *Archives of Psychiatric Nursing*, *34*(6), 472-480. https://doi.org/10.1016/j.apnu.2020.08.001 -China Level III	Investigating the impact of a mobile health application on medication adherence	RTC	84 discharged patients recruited from a mental health center. 42-experimental, 42-control	Participants received reminders for taking medication 2–4 times a day and education messages once a week, for six months	Experimental group was 28% more likely to be adherent to their prescribed antipsychotics than the control group.	