IMPROVING TREATMENT OF METABOLIC SIDE EFFECTS FROM ATYPICAL ANTIPSYCHOTICS

by

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ABSTRACT

Atypical antipsychotics are commonly used to treat a variety of mental health disorders in children and adolescents. Prescribing atypical antipsychotics is not without risk as the development of metabolic side effects can lead to reduced life expectancy from chronic metabolic diseases. The metabolic side effects from atypical antipsychotics are considered treatable medical conditions requiring appropriate screening and intervention. Despite recommendations, psychiatric providers do not consistently screen and treat metabolic abnormalities, creating a gap in care for these individuals. This quality improvement project took place on an adolescent inpatient residential unit. This project focused on incorporating recommendations from clinical practice guidelines by focusing on improving rates of metabolic screening and utilization of treatment interventions when metabolic abnormalities are identified to reduce the burden of metabolic side effects for patients. The Plan-Do-Study-Act framework was used to guide this quality improvement project over six weeks with four separate cycles varying in duration from one to two weeks each. A metabolic screening bundle for psychiatric provider notes was created within the electronic health record to improve ease of interpreting metabolic screening values and identifying need for further intervention. At the end of the quality improvement project, rates of metabolic screening remained unchanged. The rate of patients receiving treatment interventions increased and multiple patients received more than one treatment intervention. Treatment modalities studied included metformin, individual physical activity, and nutritionist consult. This quality improvement project sought to decrease patients experiencing metabolic abnormalities after treatment with atypical antipsychotic medication, but effectiveness was unable to be measured due to the short time frame. Metabolic screening is a necessary part of atypical antipsychotic treatment that needs to be completed upon initiation of medication and at future appointments. Once metabolic screening is completed, further education on potential treatment interventions for metabolic abnormalities needs to be discussed with the patient and other professionals involved in their care to improve patient outcomes.

CHAPTER ONE

INTRODUCTION

Problem Identification

Although atypical antipsychotics help treat psychiatric symptoms, the metabolic side effects associated with atypical antipsychotic administration can lead to impaired tolerability related to metabolic abnormalities associated with metabolic syndrome (Correll et al., 2009; Bobo et al., 2013). The metabolic side effects of atypical antipsychotics are considered treatable medical conditions but, without proper treatment, can lead to decreased life expectancy in these individuals (Cotes et al., 2017). Clinical practice guidelines have been released, encouraging metabolic screening and treatment of metabolic abnormalities for children and adolescents to prevent the onset of chronic metabolic diseases. Despite the guidelines' release, psychiatric providers do not consistently engage in the treatment of metabolic abnormalities associated with atypical antipsychotics and rely on primary care providers for treatment, creating a gap in care for these individuals (Cotes et al., 2017).

Background and Significance

Second-generation antipsychotics or atypical antipsychotics are utilized frequently in children and adolescents to address various mental health disorders. Currently, atypical antipsychotics have FDA-approval for treatment in children and adolescents for schizophrenia, Tourette's disorder, bipolar 1 disorder, depression and irritability associated with autism spectrum disorder (Sultan et al., 2018; Sohn 2016). These medications are also frequently used

off-label for aggressive behaviors, ADHD, other psychotic disorders, neurotic disorders, and others (Sohn, 2016). With so many uses for this class of medications, there are approximately 3.8 million prescriptions for atypical antipsychotics for children and adolescents ages 3-18 yearly (Sultan et al., 2018)

The side effects of second-generation antipsychotics put individuals at increased risk for chronic metabolic diseases. Children and adolescents are not immune to the adverse side effects of these medications and are more vulnerable to the metabolic side effects of age-inappropriate weight gain, obesity, elevated blood pressure, elevations in triglycerides and LDL cholesterol, and elevation of fasting glucose (Arango et al., 2014). This leads to an increased risk of metabolic syndrome, which increases the risk for a patient to develop cardiovascular and metabolic diseases, including coronary artery disease, type II diabetes, and stroke (ADA & APA, 2004). A child or adolescent is diagnosed with metabolic syndrome when three or more of the following criteria are met: increased waist circumference, body mass index greater than the 85th percentile for age, elevated triglycerides greater than 150 mg/dL, HDL cholesterol less than 40 mg/dL, hypertension and fasting glucose greater than 100mg/dl (NHLBI, 2019; Arango et al., 2015).

The metabolic side effects of atypical antipsychotics are considered treatable medical conditions but without proper treatment, can lead to a decreased life expectancy of approximately 20 years compared to the general population (Cotes et al., 2017; Ilyas, Chesney, & Patel, 2017). Early monitoring of these medication side effects is essential when providing psychiatric treatment as these metabolic side effects can have lasting negative impacts on the individual into adulthood (Arango et al., 2014). Despite the presence of unwanted side effects

from atypical antipsychotics, these medications are still recommended to treat mental illness in children and adolescents (McClellan & Stocks, 2013). Providers prescribing these medications will need to ensure proper monitoring and follow-up occurs, and adjunctive medication may be necessary to reduce the severity of side effects (McClellan & Stocks, 2013).

Individuals with severe mental illness are 2 to 3 times more likely to suffer from cardiometabolic disease, with 1 in 10 diagnosed with type II diabetes mellitus and 1 in 3 diagnosed with metabolic syndrome (Ilyas, Chesney, & Patel, 2017). Treatment and management of chronic diseases associated with metabolic syndrome are costly to the healthcare system, with nearly 90% of the United States' yearly healthcare expenditure spent providing treatment for chronic medical illness and mental health treatment (NCCDPHP, 2020). In the United States, the cost of treatment for heart disease and stroke costs $214 billion annually and leads to $138 billion in lost productivity (NCCDPHP, 2020). Care for individuals with diabetes leads to around $327 billion in medical costs and lost productivity. Additionally, obesity results in $147 billion in medical costs yearly with an estimated 19% of children and 42% of adults considered obese (NCCDPHP, 2020).

When utilizing any psychopharmacologic intervention, it is recommended providers work with the family and the minor to develop a plan for short and long-term monitoring of both the effectiveness concerning mental health symptomology and side effects (Walkup, 2009). If appropriate monitoring cannot be completed, prescribers should be wary of prescribing atypical antipsychotics (Walkup, 2009). When initiating atypical antipsychotics, treatment guidelines released by the American Diabetes Association (ADA) and American Psychiatric Association (APA) recommend regular metabolic screening for individuals before initiation and at follow-up

appointments to identify metabolic abnormalities (ADA & APA, 2004). Recommended baseline monitoring includes BMI, waist circumference, blood pressure, fasting plasma glucose, fasting lipid profile, and personal/family history of metabolic syndrome (ADA & APA, 2004). In addition to baseline monitoring, weight should be measured at 1, 2, and 3 months after initiation and quarterly after starting atypical antipsychotics (ADA & APA, 2004).

Scope of the Problem

In Montana, a child and adolescent behavioral health facility identified pediatric patients prescribed atypical antipsychotics with metabolic abnormalities are not consistently receiving treatment despite recommendations by nationally recognized clinical practice guidelines. This health facility provides treatment for a wide range of mental health diagnoses to individuals aged 3-18. Anecdotal reports by nurses working at the facility demonstrate concern over the number of patients experiencing a significant amount of weight gain when prescribed atypical antipsychotic medications within both the inpatient and outpatient treatment settings. According to a child and adolescent psychiatrist, reports of patients gaining around 30 or more pounds over a three to four-month stay are not uncommon. During residential stays, the patients are provided additional support to manage the metabolic side effects, including consults with a dietician or increased time with a recreation therapist for physical activity. Despite increased education and lifestyle interventions, it can be difficult for these individuals to slow or reverse the weight gain caused by the medication. The excess weight is concerning for both the patient and their guardian and can lead to discontinuing the medication despite efficacy controlling mental health symptoms. Discontinuing psychiatric medications abruptly has the potential for reoccurrence of psychiatric symptoms and physical discomfort (Stahl, 2013).

Proposed Evidence-Based Intervention

Psychiatric providers have been encouraged to incorporate metabolic screening and treatment of metabolic abnormalities as the standard of care for all patients prescribed atypical antipsychotics since 2004 (ADA, APA, & AACP, 2004). Guidelines were released again in 2008 and 2016, reinforcing the same recommendations for adolescents and adults (Cooper et al., 2016; Correll, 2008). Multiple clinical practice guidelines encourage metabolic screening and treatment of metabolic abnormalities (ADA, APA, & AACP, 2004; Cooper et al., 2016; Correll, 2008). Despite the guidelines' recommendations, psychiatric providers do not consistently engage in the treatment of metabolic abnormalities associated with atypical antipsychotics and rely on primary care providers for treatment within the facility (Cotes et al., 2017). Rates of metabolic monitoring increase when metabolic screening tools are incorporated into the provider's workflow (Wiechers et al., 2012; Latoo et al., 2015. The purpose of this quality improvement (QI) process was to improve the quality of life for patients prescribed atypical antipsychotics through metabolic screening and early treatment of metabolic side effects. This project incorporated a metabolic screening bundle into the psychiatric provider's progress note to increase rates of screening and treatment of metabolic syndrome. The metabolic screening bundle included the patient's most recent values vital signs, including weight from time of admission. In addition, the two most readings for BMI percentile for age, fasting glucose, glycosylated hemoglobin, total cholesterol, HDL, LDL, and triglycerides. When pulled into the provider's note within the EHR, abnormal values are bright red, alerting the provider when additional intervention is necessary.

The organization's mission is to "heal, help, and inspire hope." By improving provider education on the treatment of atypical antipsychotic side effects, the quality of care provided to the patients will improve and promote healing and reduce or prevent future health complications associated with metabolic syndrome. This organization provided inpatient treatment to over 2,500 children and adolescents from Montana in 2019. Additionally, this project's data can be used to track outcome measures, which is part of the organization's strategic plan. Currently, the organization wishes to start implementing outcome measures specific to each service. This information will be consolidated as part of the organization's performance indicators.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

The following chapter reviews literature as it relates to the clinical practice guidelines that will inform the implementation of this project. There are three clinical practice guidelines relating to the management of the metabolic side effects of atypical antipsychotics. In addition to the clinical practice guidelines, supporting evidence will be provided for each of the recommended treatment modalities for metabolic side effects that will be referenced. The data used to support these recommendations were obtained from research focusing on children and adolescents receiving atypical antipsychotics as treatment for mental illness.

Antipsychotic Medication Effects

Atypical antipsychotic medication alleviates psychotic symptoms, with decreased risk of extrapyramidal symptoms and hyperprolactinemia compared to first-generation antipsychotic medication (Stahl, 2013). Although atypical antipsychotics have less risk of movement disorders and hyperprolactinemia, this class of medications still has the potential for serious side effects. Atypical antipsychotics antagonize serotonin (5HT) and dopamine (D) within the central nervous system leading to a blockade within several receptor sites resulting in therapeutic and side effects (Elbe et al., 2019).

Much of the beneficial effects of atypical antipsychotics are a result of antagonism at D2 and 5-HT2A receptor sites (Elbe et al., 2019). Antagonism at D2 receptor sites target the

symptoms of psychosis, including delusions, hallucinations, and disorganized behavior (Elbe et al., 2019; Stahl, 2013). Antagonism of 5-HT2A is associated with improvement of affective blunting, decreased social drive, inability to experience pleasure, and decreased motivation (Elbe et al., 2019; Stahl, 2013).

Antagonism of histamine receptors is responsible for many of the endocrine and metabolic side effects of dyslipidemia, impaired glucose metabolism, and weight gain. (Elbe et al., 2019; Stahl, 2013). Changes to the lipid panel can include increases in total cholesterol, LDL cholesterol, and triglycerides with decreases in HDL cholesterol (Elbe et al., 2019). Impaired glucose metabolism can lead to an increased risk of insulin resistance and hyperglycemia (Elbe et al., 2019). Weight gain is also typical with antipsychotic medication. Medication naïve children and adolescents typically gain 4-8kg in the first three months after initiation of antipsychotic treatment (Elbe et al., 2019). The medications in the antipsychotic class with the greatest potential for metabolic side effects are clozapine and olanzapine (Elbe et al., 2019). Quetiapine, risperidone, and paliperidone are associated with moderate risk, with the lowest risk medication being ziprasidone and aripiprazole (Elbe et al., 2019). Limited information is available to understand the risk of metabolic side effects of asenapine, iloperidone, and lurasidone (Elbe et al., 2019).

Clinical Practice Guidelines for Antipsychotic Therapy

Metabolic Monitoring

Clinical practice guidelines provide recommendations for metabolic screening and treatment of metabolic abnormalities. In 2004 a consensus statement providing clinical practice guidelines with recommendations for metabolic screening in adults was released as part of a joint

collaboration between The American Diabetes Association (ADA), American Psychological Association (APA), and the American Association of Clinical Endocrinologists (AACE) (ADA, APA, & AACE, 2004). The American Academy of Child and Adolescent Psychiatry (AACAP) released guidelines specific to safe atypical antipsychotic use in children and adolescents (Correll, 2008). Finally, the British Association for Psychopharmacology (BAP) has released the most current practice guidelines for monitoring and treating atypical antipsychotic side effects in adults (Cooper et al., 2016). All three clinical practice guidelines recommend metabolic monitoring as the first step to reducing the morbidity and mortality associated with metabolic syndrome in individuals of all ages prescribed atypical antipsychotic medication.

The consensus statement released by the ADA, APA, AACE is the most widely used recommendation for metabolic monitoring and is referenced in the other two clinical practice guidelines (Cooper et al., 2016; Correll, 2008). All three clinical practice guidelines agree on the importance of baseline monitoring before or soon after the initiation of atypical antipsychotic medications. Baseline monitoring should include personal and family history of diabetes, weight and height used to calculate BMI, waist circumference, blood pressure, fasting plasma glucose, and a fasting lipid profile (ADA, APA, & AACE, 2004; Correll, 2008). The frequency of follow-up monitoring recommendations varies amongst the guidelines, with the American Academy of Child and Adolescent Psychiatry recommending more frequent monitoring of BMI taking place at every visit, regardless of appointment frequency (Correll, 2008). However, monitoring BMI in adults is recommended quarterly after monthly check-ups the first three months (ADA, APA, & AACE, 2004).

Adult clinical practice guidelines recommend that blood pressure, pulse, and fasting plasma glucose are monitored at the 3-month follow-up and then annually (ADA, APA, & AACE, 2004; Cooper et al., 2016). The AACAP recommendations differ slightly in that fasting blood glucose monitoring should occur at baseline, the 3-month follow-up and then twice a year (Correll, 2008). The ADA, APA and AACE all recommend monitoring of the lipid panel at the 3-month follow-up and then annually if abnormal, or every 5 years if lipid levels are within normal limits. The AACAP again recommends for more frequent monitoring stating that the lipid panel should be monitored at baseline, 3-month follow-up and then twice yearly afterwards (Correll, 2008).

Defining Abnormal Metabolic Values

The AACAP released standards for when metabolic values are considered abnormal in children and adolescents (Correll, 2008). A child or adolescent is considered overweight when their BMI is greater than the 85th percentile for age, LDL greater than 130 mg/dL, HDL less than 40 mg/dL, triglycerides greater than 110 mg/dL, blood pressure greater than the 90th percentile for age and sex, and fasting glucose greater than 125 mg/dL (Correll, 2008). Abnormal metabolic values are defined for adults in the guidelines published by ADA, APA, AACE and BAP (ADA, APA, AACE, 2004; Cooper et al., 2016). Both guidelines have similar values for determining abnormal metabolic values but only give information specific to the adult population.

Interventions for Abnormal Metabolic Values

Once the thresholds for metabolic abnormalities have been reached, the recommended treatment is consistent amongst clinical practice guidelines. If metabolic side effects develop, the

initial intervention recommended is to change the atypical antipsychotic dose or change the antipsychotic to one associated with less metabolic risk (Correll, 2008; Cooper et al., 2016). Unfortunately, it is not always possible to adjust the antipsychotic medication or dose and still address the patient's psychiatric symptoms. In this instance, lifestyle interventions and the use of pharmacological interventions, primarily metformin, are recommended treatments to address weight gain (Correll, 2008; Cooper et al., 2016).

Lifestyle interventions with a focus on healthy eating, exercise, and tobacco cessation can be implemented to control weight gain (Correll, 2008; Cooper et al., 2016). Intensive lifestyle intervention programs have led to significantly less weight gain, BMI percentile for age increases, and decreased waist circumference compared to standard care in children and adolescents (Curtis et al., 2016). Despite much success in limiting metabolic changes using lifestyle interventions in the short-term, the lifestyle interventions have limited long-term efficacy (Cooper et al., 2016).

When lifestyle interventions and changing the atypical antipsychotic agent are ineffective at treating metabolic side effects, initiation of metformin is recommended. Metformin has been shown to have significant effects on reducing BMI, insulin resistance, LDL cholesterol, and total cholesterol levels in children and adolescents prescribed atypical antipsychotics (Ellul, Delorme, & Cortese, 2018; Wu et al., 2016). No significant difference is seen in triglyceride levels, fasting glucose, and HDL cholesterol (Wu et al., 2016). No difference is seen in fasting glucose for these individuals, as metformin is not associated with hypoglycemia for individuals with glucose levels within the normal range (Jiang et al., 2020; Wu et al., 2016). Metformin is a safe

intervention for treating metabolic side effects, with the most common adverse effect being gastrointestinal upset (Ellul, Delorme & Cortese, 2018; Wu et al., 2016; Jiang et al., 2020).

Strengths and Limitations of the Evidence

The three clinical practice guidelines reviewed for this project are all considered highly regarded professional organizations within the field of psychiatry. The recommendations for metabolic screening released by the ADA, APA, and AACE were cited in the other two practice guidelines. Among the three clinical practice guidelines, there are many similarities amongst recommendations. Clinical practice guidelines released by the ADA, APA, and AACE along with the AACAP are both considered outdated as they were published in 2004 and 2008, respectively, but the recommendations released by the BAP in 2016 are consistent with the other two guidelines. One limitation of the evidence reviewed is the difference in metabolic screening recommendations for children and adolescents due to differences in physical development, which is noted in the clinical practice guidelines released by the ADA, APA, AACE, and BAP. The AACAP clinical practice guidelines will be used as the backbone for this scholarly project as the target populations of children and adolescents are congruent with each other.

Importance of Practice Change

Prescribing practices are influenced as approximately seventy percent of the patients served within the organization are insured under Medicaid. Few of the atypical antipsychotics with the lowest risk for metabolic side effects are “non-preferred” medications for Medicaid, resulting in high out of pocket costs for patients (Mountain Pacific Quality Health, 2020). Asenapine and ziprasidone are associated with the lowest risk but are often not able to be used

due to financial limitations of the population served (Elbe et al., 2019). If prescribing atypical antipsychotic medication is deemed necessary, many atypical antipsychotics affordable to patients have a high or moderate likelihood of metabolic side effects. When treatment of metabolic side effects is necessary, metformin is on the preferred drug list for Medicaid and can be a cost-effective treatment modality for these individuals.

Knowing the risk of metabolic side effects in this population is high, identification of abnormal values can be recognized, and treatment interventions can be initiated in a timely fashion. By incorporating the most recent values of metabolic monitoring into the psychiatric provider's progress note, the visibility of abnormal metabolic screening values is increased by the EHR flagging abnormal values. This allows psychiatric providers to be made more aware when additional intervention is necessary.

CHAPTER THREE

SETTING AND METHODS

Quality Improvement Framework

The framework that guided this QI project was the Plan, Do, Study, Act, or PDSA, framework. The PDSA framework is best utilized when improvement is sought. With this model, multiple cycles are completed sequentially to test changes to the microsystem until the goals are obtained and sustained long-term. The PDSA framework's backbone is created of sequential cycles of change testing composed of planning, doing, studying, and acting (Nelson, Batalden & Godfrey, 2007).

The planning phase of the cycle is focused on clearly identifying objectives to be tested, stakeholder preparation, and discussion of potential impacts on others. These steps are necessary to ensure the stakeholders are aware of the changes tested, including the timeframe for the cycle and hypothesis (Nelson, Batalden & Godfrey, 2007). Required preparation includes completing any education and training, identifying who, how, and when data will be collected, and clarifying roles (Nelson, Batalden & Godfrey, 2007). When completing the do phase of the PDSA cycle, the stakeholders carry out the plan while documenting any problems encountered and collecting quantitative and qualitative data (Nelson, Batalden & Godfrey, 2007).

After the PDSA cycle’s doing phase is completed, the team will need to compile the data to begin the studying and acting stages. During the studying phase, the data analysis is conducted, including comparing the data to hypotheses and then summarizing findings (Nelson, Batalden & Godfrey, 2007). The final stage is act, where changes tested are kept, modified, or

discarded (Nelson, Batalden & Godfrey, 2007). The cycle then starts over again with a new planning cycle taking into account the lessons learned from the previous cycle. This process repeats until the goal for the project has been met and the changes made have been deemed sustainable.

There are several benefits to this QI framework for guiding this QI project. This framework is focused on testing small changes in a short timeframe (Nelson, Batalden & Godfrey, 2007). This process will be helpful for this QI project as multiple PDSA cycles can take place over a six-week timeframe. This provides the opportunity for ongoing assessment to improve future cycles based on what has been learned.

Agency Description

The agency where this QI project took place is a children's psychiatric hospital in central Montana, providing both inpatient and outpatient care for those aged 3-18. This QI project took place in a 20-bed residential adolescent unit providing treatment to adolescents aged 11-14 with a variety of mental health diagnoses. The length of stay averages 2-4 months in duration. The target population for this QI project were patients on the residential unit prescribed atypical antipsychotic medication. While residing in the residential unit, there was an interdisciplinary team involved in the treatment planning process. The project stakeholders are the psychiatrist, certified recreation therapy specialists (CTRS), dietician, and registered nurses working on the unit.

Current Processes

Upon admission into the hospital, metabolic screening is routinely obtained for most patients. This includes obtaining height, weight, BMI, BMI percentile for age, lipid panel, metabolic panel, and vital signs. Before this QI project, waist circumference was not routinely obtained. While a patient is in the hospital, nurses completed vital signs daily for the first three days and weekly afterward. Height and weight are obtained upon admission and weekly for the duration of the inpatient admission.

While admitted to the hospital, the patients can participate in a variety of structured therapeutic activities. The unit schedule includes one group activity led by the CTRS daily with several other active groups led by activity assistants. Patients also participate in didactic programming focusing on psychoeducation and overall wellbeing. The campus allows for physical exercise daily using multiple modalities, including gyms, outside playgrounds, swimming pool, ropes course, and other outdoor spaces.

The psychiatrist meets with the patient on at least a weekly basis. After meeting with the patient, the psychiatrist enters a note into the EHR using a progress note template. Information gathered from the interdisciplinary team during weekly rounds and monthly treatment team meetings are added to the note. Labs completed within the prior week are added to the note. With input from the interdisciplinary team or at the provider's discretion, consults for individual sessions with the CTRS and dietician can be ordered to focus on healthy lifestyles and nutrition. There is currently no concrete process for when consults for additional support are ordered.

With any change in practice, potential barriers to implementation must be considered. The most significant potential barriers are changes to the nurse's workflow and amending the psychiatric provider's progress note template. Concerning the nursing workflow, waist

circumference will need to be incorporated into the standard of care. The facility began using a new EHR less than two years ago. Many changes to the nurses' workflow took place and obtaining waist circumferences monthly was omitted from the standard of care workflow because it had not been included in the EHR parent organization's standard of care. A potential barrier to the psychiatric provider's updated progress note template is a covering physician not utilizing the template with the metabolic screening bundle if they are covering patients.

Project Design

The purpose of this QI project was to improve the quality of life of patients prescribed atypical antipsychotic medication through metabolic screening and the use of early treatment interventions for metabolic side effects. By identifying side effects early, the goal was to prevent or delay the onset of chronic metabolic diseases. This was accomplished by improving psychiatric provider awareness of clinical practice guidelines for managing the metabolic side effects of atypical antipsychotic medication and adding a metabolic screening bundle into the progress note. The goal was to improve the treatment of metabolic side effects on an adolescent inpatient unit when one or more metabolic abnormality was present.

There were several goals of this QI project. The first goal was for 100% of patients prescribed atypical antipsychotics to receive baseline metabolic screening upon admission into the facility. This included blood pressure, lipid panel, fasting glucose, height, weight, and waist circumference. When all patients prescribed atypical antipsychotics receive metabolic screening, treatment of metabolic abnormalities will need to occur. The goal was for 100% of patients with a BMI percentile above the 85th percentile for age based on CDC guidelines, triglycerides greater than 150 mg/dL, HDL cholesterol less than 40 mg/dL, hypertension, or fasting glucose

greater than 100mg/dl receive additional interventions including dietary consults, recreation therapy consults or a metformin prescription. In the long term, the objective will be to have 0% of patients experiencing metabolic abnormalities after six months of treatment with atypical antipsychotics. For additional site-specific barriers and facilitators to implementation, see Appendix A.

Project Methods

This QI project utilized education to treatment team members on clinical practice guidelines, amending the psychiatric provider's progress note template to add a metabolic screening bundle to improve awareness and queue additional treatment when metabolic abnormalities were present. The metabolic screening bundle included the patient's most recent values vital signs, including weight from the time of admission and the most recent, the two most readings for BMI percentile for age, fasting glucose, glycosylated hemoglobin, total cholesterol, HDL, LDL, and triglycerides. When pulled into the provider's note, abnormal values were flagged, alerting the provider when additional intervention was necessary.

To successfully integrate metabolic screening and treatment for patients on the adolescent residential unit, a series of PDSA cycles were completed over six weeks. In December 2020, a meeting with stakeholders in the project was held, including the psychiatrist, CTRS, nurses, and dietician occurred. This meeting's purpose was to provide a training session on current clinical practice guidelines, goals of the project and describe how each discipline will be impacted. Baseline data on rates of patients receiving complete metabolic screening at admission or upon initiation of antipsychotics and rates of patients receiving at least one additional intervention, including dietary consults, recreation therapy consults or a metformin prescription when

metabolic abnormalities were present. To evaluate the effectiveness of the intervention rates of patients receiving complete metabolic screening and at least one additional intervention when metabolic criteria are met would be obtained by running reports created within the EHR and verified by manual chart review. This information would be gathered once per cycle to inform the team of current practices and identify areas for improvement.

The initial PDSA cycle took place over one week, and the stakeholders met to analyze the results and make plans for future cycles. A second PDSA cycle of a one-week duration occurred next, with two 2-week cycles taking place afterward. For more specific details on project methods, see Appendix B.

Expedited Institutional Review Board approval was obtained by Montana State University before engaging in the QI project. Written permission was also acquired by the facility allowing access to patient charts. All data extracted from the EHR was de-identified and stored on the facility's network.

CHAPTER FOUR

OUTCOMES

Children and adolescents prescribed atypical antipsychotic medication are at increased risk of metabolic abnormalities due to side effects from the medications (Correll et al., 2009; Bobo et al., 2013).. Current clinical practice guidelines encourage psychiatric providers to obtain baseline measurements for metabolic screening upon initiation of atypical antipsychotic medication and at routine intervals (ADA, APA, & AACE, 2004; Cooper et al., 2016; Correll et al., 2008). Once metabolic screening has taken place and metabolic abnormalities are identified, further treatment interventions are recommended to prevent the development of metabolic syndrome (ADA, APA, & AACE, 2004; Cooper et al., 2016; Correll et al., 2008).. This QI project sought to improve the ease of identifying metabolic abnormalities leading to increased utilization of treatment interventions for metabolic side effects.

Changes to the EHR included the creation of a metabolic screening bundle. The bundle is a smart phrase that can be pulled into the psychiatric provider's progress notes when a patient is initiated on an atypical antipsychotic and at discharge if prescribed an atypical antipsychotic. The metabolic screening bundle was completed and shared with the child and adolescent psychiatrist on December 15, 2020. To improve ease of use with the metabolic screening bundle, changes to the structure of the bundle were completed December 31, 2020 after the second PDSA cycle. The changes included pulling values specific to metabolic screening instead of the entire laboratory panel being pulled into the note, so only the two most-recent values for fasting glucose, LDL, HDL, and triglycerides were added. This allowed the metabolic screening bundle to be tailored towards values of interest and alerting the provider with bright red letters when

abnormal values are present. During the 3rd and 4th PDSA cycles, the metabolic screening bundle was used in all discharge summaries and progress notes when atypical antipsychotics were initiated.

The project goal for all patients prescribed atypical antipsychotics to receive baseline metabolic screening upon admission into the facility was not met. This includes blood pressure, lipid panel, fasting glucose, height, weight, and waist circumference. At the end of data collection, there were 17 patients prescribed atypical antipsychotics. Compete baseline metabolic screening was not obtained for these individuals due to waist circumference being missing. All patients had blood pressure, lipid panel, fasting glucose, height, and weight values completed for baseline metabolic screening.

Another goal of the project was for all patients prescribed atypical antipsychotics with at least one metabolic abnormality, including BMI percentile above the 85th percentile for age, triglycerides greater than 150 mg/dL, HDL cholesterol less than 40 mg/dL, hypertension, or fasting glucose greater than 100mg/dl to receive additional treatment interventions including at least one of the following: dietary consultation, 1:1 physical activity with allied therapy staff, or prescribed metformin. This goal was not met. At the end of data collection, 11 patients met the criteria for additional treatment interventions due to the presence of at least one metabolic abnormality. Of those 11 patients, 10 received at least one recommended treatment intervention.

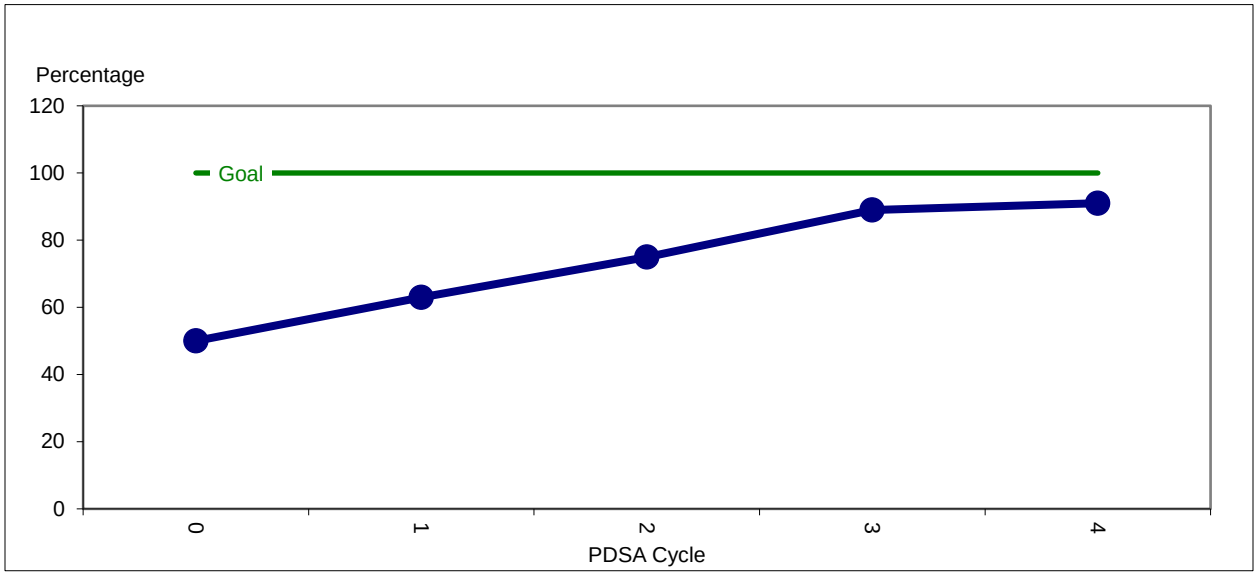

Figure 1. Rates of Patients Receiving Interventions for Metabolic Abnormalities

This project's final goal was not to have any patients experiencing metabolic abnormalities after six months of treatment with atypical antipsychotics. This QI project's data collection timeframe was six weeks, and data for this goal is unavailable. Although this goal could not be evaluated at this time, utilization rates of treatment interventions for metabolic abnormalities increased while rates for patients receiving no intervention decreased. For rates of utilization of various treatment interventions, see figure 2 below.

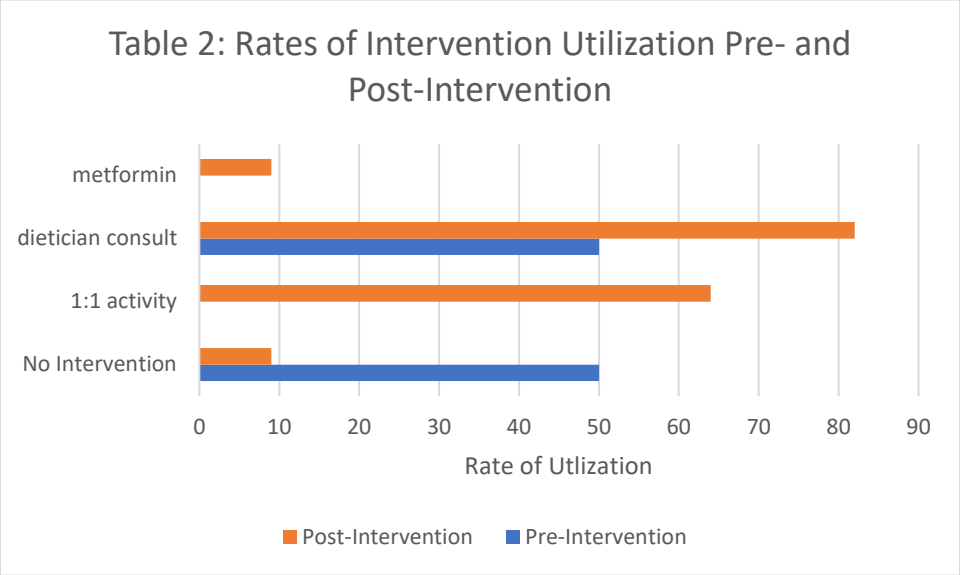

Figure 2. Rates of Intervention Utilization Pre- and Post-Intervention

This QI project's main findings included increased utilization rates of treatment interventions for metabolic abnormalities in adolescents prescribed atypical antipsychotic medication. A metabolic screening bundle was created and had the capability to pull metabolic screening values into the progress note while identifying abnormal values. While comprehensive metabolic screening was not obtained for any of the patients due to waist circumference values missing, the percentage of patients receiving additional interventions when meeting criteria for metabolic abnormalities improved.

CHAPTER FIVE

DISCUSSION

Introduction

Atypical antipsychotics are utilized to treat a variety of mental health conditions in children and adolescents. When prescribed atypical antipsychotics, these individuals are at an increased risk of developing metabolic abnormalities associated with the development of chronic diseases associated with decreased life expectancy. This QI project aimed to decrease the rates of patients experiencing metabolic abnormalities due to treatment with atypical antipsychotic medication. A metabolic screening bundle was created within the EHR that compiled the most current and historical metabolic screening values with abnormal values bold and red. This QI project focused on ensuring patients received baseline metabolic screening when prescribed atypical antipsychotic medication and implementing evidence-based treatment interventions including dietician consultation, 1:1 physical activity with allied therapy staff, or metformin prescription metabolic abnormalities identified. After this QI project, the rates of patients receiving additional treatment interventions when metabolic abnormalities were identified increased from 50% at baseline to 91% at the conclusion.

Findings

Despite much research performed on this topic, rates of metabolic screening in individuals consistently remain suboptimal for children and adolescents prescribed atypical antipsychotic medications (Cotes et al., 2017; Connolly et al., 2015; Jeffrey, 2015; Thompson et al., 2011). Overall, this facility performs metabolic screening at a high rate for all individuals receiving

inpatient treatment. Values for metabolic screening are obtained as they are part of the standard set of admission orders for patients when admitted into the hospital. One area of improvement to meet the recommendations from clinical practice guidelines was obtaining waist circumference (ADA, APA, & AACE, 2004; Correll, 2008). All patients at baseline and the end of the project received metabolic screening, except waist circumference values were absent. The facility adopted a new EHR in February 2019, and with the change waist circumference was no longer obtained at admission and monthly thereafter. At the time of this QI project, obtaining and documenting waist circumference was not the facility's priority for incorporation into the nurse's workflow as the informatics department was working towards optimizing other areas of the workflow. Future work to incorporate waist circumference into the organization's workflow was recommended to ensure recommended metabolic monitoring can be completed.

The results of this QI project also mirrored the finding in previous research regarding increased rates of treatment for metabolic abnormalities when informatics technology is utilized (Latoo et al., 2015). This QI project focused on creating a metabolic screening bundle for psychiatric providers to use a tool to identify metabolic abnormalities. The metabolic screening bundle increases the providers' efficiency as the metabolic screening bundle consolidates information from multiple areas within the EHR. One of the challenges faced in this project was the creation of a metabolic screening bundle that was able to be added to the psychiatric provider's progress note in a format that was both informative and useful.

While completing the PDSA cycles, the team identified the need for modifications within the metabolic screening bundle to improve its ease of use. The initial metabolic screening bundle pulled the most recent results from the complete metabolic panel and lipid panel. There was a lot

of information to sort through as the values of interest for metabolic screening were only glucose, triglycerides, LDL, and HDL. A lot of information was within the bundle, and it also did not show trends for the metabolic values which resulted in providers not adding the bundle to the progress notes. To address this concern, suggestions from the psychiatric provider was taken into consideration to improve how the information was displayed to show changes from previous data points while also only having data points in the bundle specific to metabolic monitoring. The previous two data points for the specific laboratory values were added and the three most recent BMI calculations were added to improve the ease of identifying changes over time.

An additional focus during the QI project was deciding when the psychiatric provider's metabolic screening bundle was most useful. While a patient admits to the residential unit, they are seen by a psychiatric provider at least once weekly. With the frequency of visits, metabolic screening values have not been reobtained or expected to have dramatically changed. To decrease the risk of provider alarm fatigue, the metabolic screening bundle was found to be most helpful when included in progress notes where specific events occur, such as at initiation of atypical antipsychotic medication and at time of discharge. At the end of the QI project, there was consideration of adding the metabolic screening bundle to the monthly treatment team progress note. Still, laboratory studies are typically not completed monthly. Additionally, the metabolic screening bundle was not seen as helpful when additional laboratory values were also ordered. It led to duplication of data within the note as the metabolic screening bundle does not have all values in the lipid panel and complete metabolic panel of interest to the provider.

During the data collection period, the number of patients with metabolic abnormalities receiving at least one treatment intervention increased. Before this project, all treatment

interventions were available to patients within the facility, but the referrals for consultation with a dietician or 1:1 activity with allied therapy staff previously were only made at the patient's request or when additional intervention was recommended to address a patient's behavior. Providers were not regularly referring patients for these non-pharmacological treatments. Metabolic screening had been completed and concern over the presence of metabolic abnormalities was discussed, but interventions were not frequently utilized to address the development of metabolic abnormalities. During this project, the process changed for the presence of metabolic abnormalities to also lead to referrals for treatment interventions when metabolic abnormalities were recognized. With the use of the metabolic screening bundle, all values for metabolic monitoring were compiled in an easy to read format and any abnormal values were emphasized with the value colored red. The presence of abnormal values then triggered the psychiatric provider to consider additional interventions to manage metabolic abnormalities such as consults for 1:1 activity with allied therapy staff, dietary consult, or initiation of metformin. Future work could be completed to build an alert into the EHR to automatically offer orders for these interventions when metabolic abnormalities are present.

Challenges and Limitations

Many of the challenges encountered during this QI project were associated with the coronavirus pandemic. When planning this project, the setting was initially the outpatient clinic within the facility. I am hypothesizing that the information regarding rates of metabolic screening would have been different from those seen in the inpatient residential setting as there is no standard set of orders for all patients to complete when receiving outpatient treatment. The psychiatric provider must remember to order laboratory studies when indicated. Before the

pandemic, the nurse in the clinic was also routinely getting the patient's vital signs, height, and weight. As a result of the pandemic, outpatient visits were moved to telehealth, which decreased the ability to complete metabolic screening. Additionally, access to outpatient treatment interventions focusing on nutrition and physical exercise were also impacted.

Given the changes with care delivery in the outpatient setting due to the coronavirus pandemic, the organization decided to change the setting of this QI project from the outpatient setting to the inpatient setting. This allowed the organization to adjust providing all appointments via telehealth and having decreased access to vital signs and laboratory studies. The change in setting of the QI project due to the coronavirus pandemic was impacted as there was increased availability of professional staff in the inpatient setting to provide treatment interventions for metabolic abnormalities. The coronavirus pandemic also negatively impacted patient census, which decreased available patients for this QI project while also improving access to professionals to provide treatment interventions. The facility decreased the number of beds on the residential unit from 20 to 12, thus reducing the number of potential adolescents meeting this project's criteria. The hospital's census cap also increased the dietician and allied therapy staff's availability to provide the treatment interventions in a timely fashion after the psychiatric provider made the referral. The improved access to professionals to provide the physical activity and dietary interventions could have impacted the number of patients receiving the metformin intervention. If the patient was receiving care on an outpatient basis, the metformin could be an more appropriate intervention as long-term success of lifestyle interventions is lacking (Ellul, Delorme & Cortese, 2018; Wu et al., 2016; Jiang et al., 2020).

With the change in setting, it was essential to recognize metabolic screening is part of a standard set of admission orders into the hospital to help rule out medical causes of psychiatric symptoms. This facility provides mental health services in both outpatient and inpatient settings. It might be helpful to discuss how this project could inform improvements to the outpatient practice as it is not part of a set of routine orders. While admitted to the residential unit, there was also improved ease of access to the dietician and allied therapy staff to provide lifestyle interventions. Additionally, when a patient was receiving mental health care on an outpatient basis, these services are not as readily available, and access can be further impacted due to services available in the community and the family's ability to pay for services. The availability of healthy lifestyle interventions available in rural areas could also impact metformin utilization to manage metabolic side effects.

This QI project aimed to decrease the rate of individuals prescribed atypical antipsychotic medication experiencing metabolic abnormalities. The data collected for this QI project was gathered over six weeks. The time frame limited the availability to monitor the effectiveness of treatment interventions. The data collected showed the improvement in the utilization of dietary consults and 1:1 activities when metabolic abnormalities are recognized. Thus, the impact of the long-term goal was unable to be realized.

Contribution to Practice

While engaging in this QI project, several benefits were realized regarding the treatment of metabolic abnormalities. The creation and optimization of the metabolic screening bundle allowed for increased ability to visualize metabolic screening values and enable the provider to identify abnormal values more efficiently. Additionally, the facility's process for referral of

individuals for dietary consults and 1:1 activity improved to address metabolic abnormalities in patients better.

Despite the conclusion of this QI project, the facility's changes remain feasible and sustainable. The access to the metabolic screening bundle can be shared with all psychiatric providers within the facility in both the inpatient and outpatient settings. Education to providers regarding recommendations in clinical practice guidelines for managing the metabolic side effects can also be offered through department meetings or the facility's web-based education platform. With further intervention, the psychiatric providers can decide when the metabolic screening bundle is most useful while accessing information learned during the PDSA cycles.

This QI project took place in a setting that can be difficult to generalize the results to other locations. Still, information learned during this project can inform future projects in a variety of specialties. The metabolic screening bundle can be adapted for use in other facilities providing psychiatric treatment and other healthcare specialties completing metabolic screening. Atypical antipsychotics are not the only class of medications commonly prescribed in mental health associated with metabolic side effects. The metabolic screening bundle and queue for treatment interventions can also be adapted to other medication classes.

Future intervention is recommended to study the impact of metabolic abnormality treatment interventions on an individual's lifespan. Specific areas of interest would be reducing health disparities for individuals with mental illness, decreasing the financial burden of chronic metabolic diseases within the healthcare system, and the impact on life expectancy for individuals diagnosed with severe mental illness.

DNP Essentials

While engaging in this QI project, many of the DNP essentials were addressed. The inspiration for this project came from the DNP essentials scientific underpinnings for practice and clinical prevention and population health for improving the nation's health as the problem of reduced life expectancy in individuals with mental illness due to treatable medical conditions motivated me to improve outcomes in a specific population. I was able to apply these essentials when developing my project by focusing on the health of individuals prescribed atypical antipsychotics and being intentional to work towards early identification and treatment of metabolic side effects. The essentials related to scientific underpinnings for practice, clinical scholarship and analytical methods for evidence-based practice, and advanced nursing practice impacted the success of this project as each of these essentials contributed to the successful translation of evidence into practice with a focus on improving outcomes by following recommendations from clinical practice guidelines. Finally, the essentials organizational and systems leadership for QI and systems thinking, information systems/technology and patient care technology for the improvement and transformation of healthcare, and interprofessional collaboration for improving patient and population health outcomes drove the functionality of the metabolic screening bundle and changes to the process for treatment intervention referrals for metabolic abnormalities. Multiple disciplines were involved in the success of this project and the input of those involved helped to create a functional metabolic screening bundle and improving the referral process for consults with allied therapy and the dietician.

Summary

This QI project sought to decrease patients experiencing metabolic abnormalities after treatment with atypical antipsychotic medication. A metabolic screening bundle was created

within the EHR that compiles most current and historical metabolic screening values with abnormal values bold and red. After identifying metabolic abnormalities, this QI project focused on ensuring patients' evidence-based treatment interventions, including dietician consultation, 1:1 physical activity with allied therapy staff, or metformin. Despite various strengths and limitations of this project, the rate of patients receiving additional treatment interventions when metabolic abnormalities nearly doubled. The intention is to prevent the development of chronic diseases that are associated with decreased life expectancy for individuals with severe mental illness.

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APPENDICES

APPENDIX A

SWOT ANALYSIS

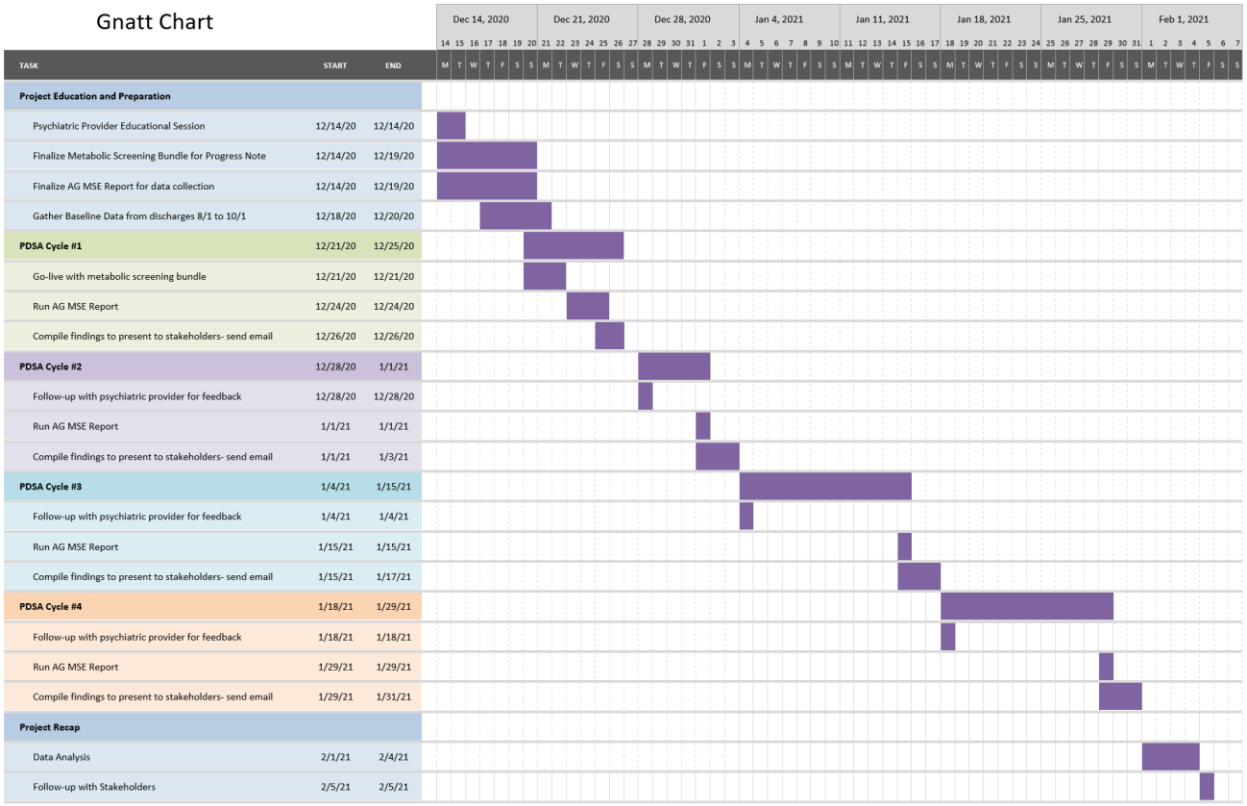
SWOT ANALYSIS

STRENGTHS	WEAKNESSES
Clinical Practice Guidelines give clear recommendations for practice	Only labs completed at hospitals with Epic or completed with third-party lab service can be pulled into progress notes
All patients typically receive metabolic screening, except for waist circumference	Metabolic bundle will be added to provider note with abnormal values accentuated, but no alert will be created
Provider progress notes can pull from flowsheet documentation including vitals and labs	Metformin has side effects, with most common involving GI upset
Metformin is an affordable generic medication typically costing less than $5 for a month supply	Incorporating metformin requires polypharmacy
OPPORTUNITIES	**THREATS**
Ability to expand project throughout organization	COVID-19 Pandemic Closes Inpatient Unit
Improve overall health of patients, which is in line with organization's mission "to heal, help, and inspire hope"	No patients on unit prescribed atypical antipsychotic medication
Increased psychiatric provider awareness of metabolic syndrome and treatment modalities available in inpatient and outpatient settings	Other Psychiatric Provider covering patients- Not familiar with metabolic screening bundle
	Staff turnover

APPENDIX B

GNATT CHART

Gnatt Chart



TASK	START	END
Project Education and Preparation		
Psychiatric Provider Educational Session	12/14/20	12/14/20
Finalize Metabolic Screening Bundle for Progress Note	12/14/20	12/19/20
Finalize AG MSE Report for data collection	12/14/20	12/19/20
Gather Baseline Data from discharges 8/1 to 10/1	12/18/20	12/20/20
PDSA Cycle #1	12/21/20	12/25/20
Go-live with metabolic screening bundle	12/21/20	12/21/20
Run AG MSE Report	12/24/20	12/24/20
Compile findings to present to stakeholders- send email	12/26/20	12/26/20
PDSA Cycle #2	12/28/20	1/1/21
Follow-up with psychiatric provider for feedback	12/28/20	12/28/20
Run AG MSE Report	1/1/21	1/1/21
Compile findings to present to stakeholders- send email	1/1/21	1/3/21
PDSA Cycle #3	1/4/21	1/15/21
Follow-up with psychiatric provider for feedback	1/4/21	1/4/21
Run AG MSE Report	1/15/21	1/15/21
Compile findings to present to stakeholders- send email	1/15/21	1/17/21
PDSA Cycle #4	1/18/21	1/29/21
Follow-up with psychiatric provider for feedback	1/18/21	1/18/21
Run AG MSE Report	1/29/21	1/29/21
Compile findings to present to stakeholders- send email	1/29/21	1/31/21
Project Recap		
Data Analysis	2/1/21	2/4/21
Follow-up with Stakeholders	2/5/21	2/5/21