Metabolic Monitoring of Pediatric Patients Prescribed Second-Generation Antipsychotic Medication: A Quality Improvement Project

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A Scholarly Practice Project presented to the Graduate Faculty of the University of Virginia in Candidacy for the Degree of Doctor of Nursing Practice

School of Nursing

University of Virginia

December 2020

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Abstract

Background: The prevalence of psychotropic medication prescription use in youth has increased over the past several years (Olfson, et. al, 2015; Patten, et. al, 2012; Pathak, et. al, 2010). National Health and Nutrition Examination Survey (NHANES) data, Centers for Disease Control and Prevention (CDC) found that between 2005 and 2010, approximately 6% of adolescents within the United States (U.S.) reported using psychotropic medication within the past month with 1% reporting use of antipsychotic medication (CDC, 2013). The American Diabetes Association-American Psychiatric Association (ADA-APA) provides best practice guidelines for SGA parameter monitoring given the prevalence of use and associated metabolic risks. However, despite formal recommendations and practice parameters being set forth, monitoring adherence of patients prescribed SGA medication remains inadequate, subpar and fragmented, overall.

Project Purpose: The purpose of this project was to implement an intervention, following ADA-APA guidelines, to improve in-patient metabolic monitoring adherence and to improve discharge recommendations for follow-up monitoring for pediatric patients prescribed SGAs.

Clinical Questions: *In patients aged 5 to 17 years prescribed second-generation antipsychotic medication, will establishing a protocol for metabolic monitoring during psychiatric admission improve monitoring adherence during admission and affect recommendations for follow-up metabolic monitoring, compared to the current standard of care?* And, *Do clinician perceptions of importance and barriers to adherence to metabolic monitoring protocols affect adherence to new professional organization guidelines?*

Participants and Setting: Participants included five medical doctors (MD) and three advanced practice psychiatric nurse practitioners (APRN-PMHNP) providing psychiatric care for pediatric patients at a small, in-patient mental health hospital situated in the Southeastern region of the United States.

Methods: Project design, Quality Improvement, was utilized to facilitate this project. Lewin's Change Theory and Iowa Model-Revised was used to develop an intervention for improving metabolic monitoring and the Plan-Do-Study-Act (PDSA) Model was used to facilitate continuous evaluation of the implementation phase of the project. A metabolic monitoring organizational policy was developed to provide procedural guidance for SGA use, following best practice guidelines (Figure 5). An educational session and Likert Scale Survey and Questionnaire were designed to learn or gain an understanding of clinician opinions related to importance of and facilitators and barriers to metabolic monitoring.

Practice Implications: Implementing an organizational metabolic monitoring policy following ADA-APA guidelines may optimize impact on both clinician's monitoring adherence and follow-up recommendations for pediatric patients prescribed SGA medication and thereby improve outcomes for this patient population.

Keywords: metabolic monitoring, clinician adherence, pediatric patients, SGA

Table of Contents

Appendices

Introduction

The prevalence of psychotropic medication prescription use in youth has increased over the past several years (Olfson, et. al, 2015; Patten, et. al, 2012; Pathak, et. al, 2010). Using National Health and Nutrition Examination Survey (NHANES) data, the Centers for Disease Control and Prevention (CDC) found that between 2005 and 2010, approximately 6% of adolescents within the United States (U.S.) reported using psychotropic medication within the past month with 1% reporting use of antipsychotic medication (CDC, 2013).

Utilization of antipsychotic medication for youth has also increased for other countries and is not exclusive to the U.S. Research shows that between 2005 and 2009, recommendations for second-generation antipsychotics (SGAs) by Canadian physicians increased by 114% (Pringsheim, et al., 2011). Additional research reports that internationally antipsychotic use trends are increasing for most countries while slightly decreasing for other countries. Kalverdijk, et. al (2017) found that between 2005 and 2012, the prevalence in antipsychotic use in several European countries increased but slightly decreased in the US. However, research found that while antipsychotic use of pediatric patients appeared to be slowing somewhat, an association between prevalence and longer duration of SGA use in children and adolescents was noted (Patten, et al., 2012).

Furthermore, metabolic monitoring is an important aspect in SGA treatment for the pediatric patient population given the risk of significant metabolic side effects associated with SGA's (Panagiotopoulous, 2012; Delate, 2014; Sjo, 2017). The metabolic side effects for pediatric patients prescribed SGAs are associated with metabolic dysregulation and increased cardiometabolic risk (Ronsley, et al., 2015; Correll, et al., 2009). Metabolic syndrome is associated with hypertension and hyperglycemia, hyperlipidemia, excess abdominal girth, weight gain and obesity (Vincenzi & Henderson, 2018). These increased risks of metabolic syndrome further demonstrate the necessity of metabolic monitoring and follow-up recommendations of

child and adolescent patients prescribed SGA medications. The prevalence of SGA utilization, associated metabolic risks and continued lag in consistent and adequate metabolic monitoring of pediatric patients helps establish the need for continued efforts to improve monitoring adherence of prescribing clinicians, using best practice guidelines. Thus, the purpose of this project was to improve metabolic monitoring adherence of SGA use for the pediatric population.

Project Purpose

The purpose of this project was to implement an intervention, following ADA-APA guidelines, to improve in-patient metabolic monitoring adherence and to improve discharge recommendations for follow-up monitoring for pediatric patients prescribed SGAs.

Clinical Questions

The clinical questions for this project are as follows: *In patients aged 5 to 17 years prescribed second-generation antipsychotic medication, will establishing a protocol for metabolic monitoring during psychiatric admission improve monitoring adherence during admission and affect recommendations for follow-up metabolic monitoring, compared to the current standard of care?* And, *Do clinician perceptions of importance of and barriers to adherence to metabolic monitoring protocols affect clinician adherence to protocol?*

Background

Given the prevalence of SGA use and increased metabolic risks associated with SGA medications, practice parameters and evidenced-based guidelines were established for providers. These guidelines and parameters offered specific guidance when prescribing and monitoring metabolic parameters for children and adolescents treated with SGAs. In 2004, the American Diabetes Association-American Psychiatric Association (ADA-APA) was the first professional organization to provide a formal consensus position statement outlining recommendations of metabolic monitoring for providers prescribing antipsychotic medications (See Table 1). Similar guidance recommendations followed, including guidelines by The Canadian Alliance for

Monitoring Effectiveness and Safety of Antipsychotics in Children (CAMESA) in 2009 and practice parameters by The American Academy of Child and Adolescent Psychiatry (AACAP) in 2011.

The ADA-APA, CAMESA and AACAP provide guidance for clinical decision-making and all highlight the importance of baseline screening and regular and follow-up monitoring when prescribing SGA medication for child and adolescent patients. Although slight variations for parameter measurement within these organizations were noted, most recommendations are consistently agreed upon and include: baseline history, height, weight, body mass index (BMI), blood pressure (BP), waist circumference, fasting plasma glucose, and fasting lipid profile when initiating SGA medication as well as follow-up and regular monitoring time points of 1, 2, 3, 4 and 12 months as well as every 5 years (ADA, 2004; CAMESA, 2009; AACAP, 2011).

Theoretical Framework

Nursing Theory

Nursing theory remains an important aspect in guiding and implementing change for advanced practice nursing. The Change Theory of Nursing was developed by Kurt Lewin in the 1940's and is well suited to inform and guide this project by facilitating change and improving healthcare outcomes (See Figure 1). Lewin, (1951) theorized a model involving three stages of change (unfreezing, change and refreezing). The first stage (unfreezing) involved assessing buy in from administration and clinicians for the development of a metabolic monitoring policy (MMP) in the absence of clinical procedural guidance. The second stage (change) involved providing an education session to review ADA-APA guidelines and the process of designing a MMP for SGA use based on best practice guidelines. And finally, the third stage (refreezing) involved establishing a metabolic monitoring protocol and evaluating adjustments necessary in facilitating permanent change for improving metabolic monitoring adherence of youth prescribed SGA medication.

Implementation Framework-The Iowa Model Revised

The Institute of Medicine (IOM) (2001) (now NAM) outlines aims to guide clinicians in providing quality care for patients to enhance quality healthcare outcomes. Research has shown the aims of effective and timely metabolic monitoring for youth prescribed SGA medications is often inconsistent. Therefore, the project focus was to improve the effectiveness and timeliness of metabolic monitoring with SGA use in the pediatric patient population. The Iowa Model Revised: Evidence Based Practice to Promote Excellence in Health Care was utilized for translating evidence into clinical practice within the selected practice setting (See Figure 2). The trigger identified was the inconsistent metabolic monitoring rates for youth prescribed SGAs. Therefore, the priority was to improve clinician's rate of metabolic monitoring and follow-up recommendations for this patient population, and by providing and education session and developing a policy outlining procedural steps for metabolic monitoring based on ADA-APA guidelines.

Plan-Do-Study-Act

The Plan-Do-Study-Act (PDSA) served as the framework for implementing evidence-based guidelines for this scholarly quality improvement project (See Figure 3). The first step of the PDSA model, Plan, included assessing the need for effective metabolic monitoring for youth prescribed SGAs as well as developing an educational session, chart audit form, Likert Scale survey and questionnaire, and a metabolic monitoring protocol for patients prescribed SGAs specific to the practice setting and based on ADA-APA guidelines. The second step of PDSA, Do, focused on the implementation phase to include an education session, chart review and data collection during pre-implementation and post-implementation and implementing the protocol for metabolic monitoring of patients prescribed SGAs using ADA-APA guidelines. The third step of the PDSA model, Study, included conducting statistical analysis of data gathered, and evaluating and summarizing results of the project. The last step of the PDSA model, Act,

included reflection of the findings and continuous evaluation and assessment associated with the rapid-cycle aspect of PDSA model. In doing so, this process revealed the need for adaption which involved development and incorporation of an additional form requested by participants for parameter documentation.

Problem Statement

Despite formal, professional organization recommended guidelines and practice parameters being set forth, recent studies show continued subpar, fragmented and inadequate metabolic monitoring rates, with few pediatric patients treated with SGAs receiving baseline and follow up metabolic monitoring (Coughlin, et al., 2018; Ghate, 2012; Javaheri, et al., 2012; Kauffman, et al., 2017; Raebel, et al., 2019). These study findings are consistent with the clinical approach to metabolic monitoring at the selected practice setting, with the current standard of care being determined by individual clinician judgment.

Review of Literature

The initial literature search was conducted in March 2018 and involved consultation and direct assistance from a University of Virginia (UVA) health sciences librarian and was updated in December 2019. Electronic databases utilized for the search included PubMed, OVID, CINAHL, PsycINFO and Web of Science. Publication years were restricted to 2011 to 2019 as to reflect more current research findings and account for the usual lag time between research evidence and translation to actual clinical practice and the need for studies comprised for publication following established best practice guidelines by CAMESA in 2009 and AACAP in 2011. Additional inclusion criteria were articles that focused on metabolic monitoring behaviors associated with SGA use in children and adolescents and articles addressing outcomes of interventions focused on improving monitoring adherence of pediatric patients prescribed SGA medications. Exclusion criteria included commentaries and editorials, non-English language

articles, studies that were adult-focused and articles that did not address metabolic monitoring parameters.

The Johns Hopkins Evidence Level and Quality Guide was utilized to assess strength and quality all articles meeting inclusion criteria. The PRISMA flow diagram was utilized to depict the article selection process (See Figure 4). Nine articles met full inclusion criteria and included 2 retrospective cohort studies, 4 retrospective cohort data analysis studies, 1 retrospective longitudinal study, 1 cross-sectional study and 1 secondary data analysis. All nine selected studies focused on aspects of metabolic monitoring for children and adolescents prescribed SGA medication (See Table 2). A "gray literature" search was also conducted and yielded 4 non-research elements that included ADA-APA's consensus position statement, CAMESA's evidence-based recommendations, British Columbia Physician Handbook, and AACAP's practice parameter guidelines (See Table 3).

A review of the existing literature yielded several studies that found metabolic monitoring of pediatric patients prescribed SGA medication using best practice guidelines was low, overall. Nolt, et. al (2017) concluded that only 13.2% of patients treated with SGA medication received monitoring for all metabolic parameters. Another study reported a compliance rate of just 20% for metabolic monitoring parameters based on the ADA-APA recommended guidelines (Javaheri, et. al., 2019). And, Ghate, et. al (2012) concluded that the majority of adolescent patients were under-monitored for BMI, fasting glucose and lipid panels, with monitoring of all parameters being just 1%.

Poor compliance was also noted in studies focusing on monitoring adherence specific to baseline metabolic parameter measures of children and adolescents initiated on a new SGA medication trial. Kauffman, et. al (2017) reported that less than 1% of patients newly initiated on a SGA trial received baseline monitoring and Raebel, et. al. (2014) found that only 11% of patients with new SGA trial received baseline fasting glucose or hemoglobin A1c testing. An

additional study, (Wakefield, et. al., 2019) focused on the metabolic monitoring rates of primary care providers compared to psychiatry. Higher rates of BMI monitoring by primary care compared to psychiatry was found, whereas no significance was found for other parameters and it was concluded that metabolic monitoring of pediatric patients beginning new SGA trials was low, overall.

Other studies focused on clinician self-reports of metabolic monitoring compared to monitoring behaviors of youth prescribed SGA medication. Rodday, et. al (2015) reported that while two-thirds of providers self-reported metabolic parameter monitoring, findings showed inconsistent monitoring patterns and moreover, measurement of waist circumference by provider self-report was found to be just 23%. And, (Minjon, et. al., 2018) found that providers self-reported compliance with metabolic monitoring but results indicated great variability, with 53% and 58% self-reporting baseline monitoring of fasting lipids and glucose and only one provider self-reporting monitoring of all parameters.

Project Design

The quality improvement (QI) design was used for this project to facilitate improved standard of care and healthcare outcomes. Utilizing the QI design, the aim was to improve both metabolic monitoring and follow up recommendations for pediatric patients prescribed SGA medication within the selected practice setting. As described earlier, both the Iowa Model-Revised and PDSA model served as the implementation framework for translating the ADA-APA guidelines into clinical practice.

Methodology

In preparation for developing and implementing this QI project, permission to both conduct and publish findings associated with the metabolic monitoring project was obtained from the medical director of the selected practice setting (See Appendix 1). The team for this project was the project leader (DNP student), four prescribing clinicians and administrative staff.

In addition, an organizational assessment was conducted to assess aspects of the clinical setting requiring consideration for designing, developing and implementing the project plan.
An outline will be provided for the implementation aspects of the project to include chart reviews, education session, metabolic monitoring protocol development and implementation and evaluation of the QI project.

Organizational Assessment

The selected practice setting is a publicly funded mental health hospital for children and adolescents located in rural Southeastern United States. It is the only state-funded in-patient psychiatric hospital for youth in Virginia and therefore serves children (ages 3 to 17 years) from all regions of the Commonwealth of Virginia. There are 48 beds within the hospital and it consists of four 12-bed units. The average length of stay is less than 7 days. The hospital treats youth with psychiatric illnesses and moderate to severe behavioral symptoms. Average monthly admissions fluctuate but can exceed 100 + patients and averages 1,100-1,200 admissions annually.

Patients are accepted for admission regardless of insurance or ability to pay. Funding is determined annually by Virginia's General Assembly budgetary allowance and therefore resources are quite limited. The hospital continues to utilize pen and paper charting but does have a shared-file system in which psychiatric, psychological and clinical assessments can be accessed between disciplines. However, physician's orders, consultations, daily charting and progress notes are hand written in patient charts. An electronic medical record charting system is anticipated in the near future. The hospital does not contain a pharmacy, lab setting, or cafeteria and therefore requires support and ancillary services of an adult state psychiatric hospital located in very close proximity. The hospital employs approximately 250 employees to include clinical staff, nurses, and therapists, direct care staff, administrative and ancillary staff.

Employees experience heavy workloads and staffing levels were noted to often be strained due to the acuity level of patients, challenges in the recruitment of ample and adequate staff and nurses, given the small rural location of the hospital. For similar reasons, the hospital struggles with retaining employees. As a result, conditions within the hospital can be quite difficult to manage from both an administrative and clinical perspective.

Administratively, the leadership team was noted to be minimal, consisting of a facility director who also serves as the medical director, an assistant facility director and in most cases only one clinical director or manager for each clinical discipline.

The organizational assessment identified strengths and limitations associated with the organization's structure and climate within the practice setting. Strengths noted included strong level of buy-in of the participating clinicians / stakeholders and small practice setting. Limitations noted for this practice setting included staff shortages, high clinician workload, rapid clinical pace and time-management issues related to frequent high census and high patient acuity. Funding and budget were also considered to be limitations within the practice setting. However, this limitation was off set by the project leader designing and implementing the project and thereby eliminating any direct financial impact to the clinical setting.

Ethical Considerations

This QI project did not involve human research. The University of Virginia Institutional Review Board (IRB) was consulted and yielded a formal letter of determination, indicating this project is a QI initiative with no human research involved (See Appendix 2). Identifying demographic information was not collected as to protect patient confidentiality. Charts reviewed for data collection received a numeric assignment, indicating order of admission to the hospital. A chart audit data form was used for data collection from patient charts and then transferred to an Excel spreadsheet. Data collection was stored on hard drive at a designated computer at the practice setting.

Participants

Participants were prescribing clinicians at the practice setting. Prescribing clinicians included six physicians and three psychiatric nurse practitioners. Inclusion criteria for prescribing clinician participants included full-time or part-time employment, with admitting privileges and engagement in direct clinical work managing psychiatric care for pediatric patients, aged 5 to 17 years. Exclusion criteria included clinicians designated as medical students, residency students, fellowship students and psychiatric nurse practitioner students.

Setting

The selected practice setting is a small 48-bed acute, in-patient psychiatric hospital for pediatric patients. The practice setting is comprised of four 12-bed units, consisting of two older-adolescent units, one middle-adolescent unit and one younger-child unit. However, units are fluid at times and are dependent on patient-specific needs and / or acuity level of patients. The hospital is located in the Southeastern region of the United States and is situated in a rural mountainous city with a current population (as of July 2019) estimated to be almost 25,000 (United States Census Bureau, n.d.). However, the practice setting functions to serve all pediatric patients that are in need of acute, in-patient mental health hospitalization across the entire Commonwealth of Virginia. Clinicians and staff within the practice setting include physicians, psychiatric nurse practitioners, psychologists, licensed therapists, and nurses, direct care staff and ancillary personnel.

Measures and Tools

Metabolic Monitoring Protocol

A policy for metabolic monitoring was developed to provide prescribing clinicians procedural guidance using ADA-APA guidelines (See Figure 5). The protocol outlines the specific steps and process of metabolic monitoring of patients already prescribed SGA

medication on admission to the hospital, of newly initiated SGA during hospitalization, and continued monitoring of patients with prolonged hospitalization.

Chart Audit Tool

The SGA Metabolic Monitoring Chart Audit Form (See Figure 6) was developed to facilitate data collection for the pre and post intervention chart reviews during the implementation phase and transferred to a designated Excel spreadsheet. Data collected included SGA use, date of admission and discharge, age, unit admitted and discharge recommendations. Patient history, height and weight with Body Mass Index (BMI), waist circumference, blood pressure, fasting blood glucose and fasting lipid profile were also collected. SPSS, Version 25 was utilized to conduct statistical analyses was to determine results and outcomes.

Metabolic Monitoring Parameter Form

A metabolic monitoring parameter form was developed to provide prescribing clinician's a single paper resource in which to document patient's metabolic monitoring parameters. This form was designed to minimize chart searches for parameters documentation located in various sections of the patient chart (See Figure 7).

Likert Scale Survey and Questionnaire

A 5-point Likert Scale survey (See Figure 8) was designed to gain opinions regarding their perceived importance of evidence-based practice and metabolic monitoring of pediatric patients prescribed SGA medication. The Likert survey form also included 2 questions related to facilitators and barriers associated with following ADA-APA guidelines. The Likert Scale survey and questions were provided to prescribing clinicians to complete at pre and post intervention time points. Results were used for comparison help determine possible change or impact in prescribing clinician's opinion over the course of the implementation phase.

Implementation Procedures

The implementation phase occurred over a period of 6 weeks with start of project beginning on June 1, 2020 and completion on July 14, 2020. The project and timeline was reviewed with and approved by the medical director of the practice setting. Following collaboration with the practice setting medical director, June 8, 2020 was set as the designated date to initiate the new metabolic monitoring protocol.

Education Session

A one-hour education session was provided to prescribing clinician's during a weekly psychiatry meeting which is considered a part of the clinician's work expectations and therefore no incentives were offered. Two prescribing clinicians participated via conference call and individual education sessions were provided for two clinicians who were unable to attend. The education session included a PowerPoint presentation reviewed ADA-APA guidelines and orientation for the new MMP to outline specific steps for the process of metabolic monitoring of patients prescribed SGAs on admission, newly initiated SGAs during hospitalization and continued monitoring for prolonged hospitalization (See Figure 9).

Clinician's were given a Likert Scale Survey and questions related to facilitators and barriers to following ADA-APA guidelines. A copy of the PowerPoint presentation and the new monitoring protocol was also given to participants. An additional 15 minutes was allotted for questions and clarification of the new protocol following the education session but was not needed. In addition, a copy of the Power Point presentation, new monitoring policy along with the Likert Survey were both hand delivered and emailed to all participants.

A courtesy email was sent to all providers three days prior to initiation of the new monitoring policy as a reminder of the start date and to provide additional opportunities or clarification (See Appendix 3). In addition, weekly emails were sent to participants to elicit needed guidance or support. Daily physical presence by project leader was provided within the

practice setting, beginning one day prior to and continuing through the first 5 days of the new metabolic monitoring protocol. Physical presence of three to four days each week continued throughout the duration of the implementation phase of the scholarly project. Physical presence allowed for continuous monitoring and evaluation as well as to provide clinical support associated with the process, as needed.

Chart Review

Inclusion criteria for the chart review included all charts of patients aged 5 to 17 years that were admitted for psychiatric hospitalization during the designated pre-intervention and post-intervention time periods. Exclusion criteria for patient charts included children under age 5 years and charts inconsistent with the designated 30-day timeframe. The retrospective chart review was conducted over a 7-day time period to initiating the metabolic monitoring policy for patients admitted between June 8, 2019 and July 7, 2019. A second chart review was conducted post 30 days post policy implementation for patients admitted between June 8, 2020 and July 7, 2020. Data collected was consistent with the retrospective chart review as outlined and was also completed over a 7-day time period.

Results

Statistical Analyses

A total of 87 charts were reviewed for all patients admitted over the two designated time periods for this project (N = 87). Pediatric patients admitted for hospitalization during the pre-implementation period was 37 (42.53%) compared to 50 (50.47%) pediatric patients admitted during post-metabolic monitoring protocol implementation period (See Table 4).

Independent Samples Mann-Whitney U Test was conducted to compare age differences to account for the lack of normal distribution for the continuous variable, age in years. The median age in years for the pre-implementation group was 14.00 (IQR = 12.50-16.00) compared to the median age in years of 15.50 (IQR = 13.00-17.00) for the post-implementation groups, and

indicated no statistically significant difference in the age of the pre-implementation and post-implementation group (MWU = 745.00, Z=-1.57, p = .117). A Chi-square test was conducted to compare the percentage of patients with SGA Use On Admission for the pre-implementation and post-implementation groups, and the Fisher's Exact Test was used to compare the percentage of patients with New SGA Trial for the pre-implementation and post-implementation groups. The percentage of patients prescribed SGA on Admission was 51.4% (N = 19) for the pre-implementation group compared to 58% (N = 29) for the post-implementation group. The result was not statistically significant ($\chi^2 = 0.380$, df = 1, p = .538). The percentage of patients started on New SGA Trial was 18.9% (N = 7) for the pre-implementation group compared to 8% (N = 4) for the post-implementation group. The result was not statistically significant ($\chi^2 = 2.295$, df = 1, p = .192) (See Table 5).

SGA On Admission

A Chi-square test was conducted to compare the adherence to metabolic monitoring parameter measures between the pre-implementation and post-implementation groups for the 48 patients who were prescribed SGA on Admission. Parameters, patient history, height and weight were measured for 100% of all patients in both the pre-implementation and post-implementation groups. Blood pressure was measured for 89.5% (N = 17) of the pre-implementation group compared to 96.6% (N = 28) of the post-implementation group. The result was not statistically significant ($\chi^2 = .981$, df = 1, p = .554). BMI was measured for 31.6% (N = 6) of the pre-implementation group compared to 51.7% (N = 15) for the post-implementation group. The result was not statistically significant ($\chi^2 = 1.893$, df = 1, p = .169). Fasting Glucose was measured for 0 (0%) of the pre-implementation group compared to 72.4% (N = 21) of the post-implementation group. The result was statistically significant ($\chi^2 = 24.460$, df = 1, p = < .001, Phi = .714). Fasting Lipid Panel was measured for 0 (0%) of the pre-implementation group compared to 72.4% (N = 21) of the post-implementation group. The result was statistically

significant (χ^2 = 24.460, df = 1, p = < .001, Phi = .714). Waist Circumference was measured for 0 (0%) of the pre-implementation group compared to 62.1% (N = 18) for the post-implementation group. The result was statistically significant (χ^2 = 18.869, df = 1, p = < .001, Phi = .627) (See Table 6).

New SGA Trial

A Chi-square test was conducted to compare the 11 out of 87 New SGA Trial metabolic monitoring parameter adherence measures between the pre-implementation and post-implementation groups. Of these 11, 7 were pre-implementation and 4 were post-implementation. (See Table 4). Fasting Glucose was measured for 28.6% (N = 2) of the pre-implementation group compared to 100% (N = 4) of the post-implementation group. The result was not statistically significant (χ^2 = 5.238, df = 1, p = .061). Fasting Lipid Panel was measured for 42.9% (N = 3) of the pre-implementation group compared to 100% (N = 4) of the post-implementation group. The result was not statistically significant (χ^2 = 3.592, df = 1, p = .194). Waist Circumference was measured for 0 (0%) of the pre-implementation group compared to 100% (N = 4) for the post-implementation group. The result was statistically significant (χ^2 = 11.00, df = 1, p = .003) (See Table 7).

Discharge Recommendations

Chi-square testing was conducted to compare the Discharge Recommendations for follow-up metabolic monitoring between pre-implementation and post-implementation groups for both SGA on Admission and New SGA Trial (See Table 5). A total of 56 patients (64.4%) received SGA on Admission or New SGA Trial. Discharge Recommendations for follow up metabolic monitoring was 13% (N = 3) of the pre-implementation group compared to 69.7% (N = 23) of the post-implementation group. The result was statistically significant (χ2 = 17.490, df = 1, p < .001, Phi=.559) (See Table 8).

Likert Scale Survey

Pre-Implementation Likert Scale Survey responses were as follows: For the question "Do you think metabolic monitoring of pediatric patients prescribed SGAs is important", all of the participants reported "Extremely or Very Important" with 83.33% reporting "Extremely important" and 17% selecting "Very important". For the question "Do you think following best practice guidelines for metabolic monitoring of pediatric patients prescribed SGAs is important", most of the participants (88%) reported "Extremely or Very Important" where 33% reported "Extremely Important", 50% reported "Very Important" and 17% said "Neutral". For the question "Do you think following best practice guidelines for metabolic monitoring of pediatric patients prescribed SGAs is important in this practice setting", most of the participants (88%) reported "Extremely or Very Important" where 33.33% reported "Extremely Important", 50% reported "Very Important" and 17% said "Neutral". For the question "Do you think it is important to use a collaborative approach for metabolic monitoring of pediatric patients prescribed SGAs", all of the participants (100%) selected "Very Important". For the question "Do you think follow-up metabolic monitoring of pediatric patients prescribed SGAs is important", all of the participants (100%) reported "Extremely or Very Important" where 40% reported "Extremely Important" and 60% reported "Very Important".

Post-Implementation Likert Scale Survey responses were as follows: For the question "Do you think metabolic monitoring of pediatric patients prescribed SGAs is important", all of the participants (100%) reported "Extremely or Very Important" with 83% reporting "Extremely Important" and 17% reporting "Very Important". For the question "Do you think following best practice guidelines for metabolic monitoring of pediatric patients prescribed SGAs is important", all of the participants (100%) reported "Extremely or Very Important" with 83% reporting "Extremely Important" and 17% reporting "Very Important". For the question "Do you think following best practice guidelines for metabolic monitoring of pediatric patients prescribed

SGAs is important in this practice setting", most of the participants (88%) reported "Extremely or Very Important where 17% reported "Extremely Important", 67% reported "Very Important" and 17% said "Neutral". For the question "Do you think it is important to use a collaborative approach for metabolic monitoring of pediatric patients prescribed SGAs", all of the participants (100%) reported "Extremely or Very Important" with 33% reporting "Extremely Important" and 67% reporting "Very Important". For the question "Do you think follow-up metabolic monitoring of pediatric patients prescribed SGAs is important", all of the participants (100%) reported "Extremely or Very important with 83% reporting "Extremely important" and 17% reporting "Very important" (see Table 9).

Pre and post-implementation themes that emerged for participant responses of "facilitators to following ASA-APA guidelines" included improved metabolic monitoring, improved patient outcomes, electronic health record / auto set orders and primary care provider involvement. Pre and post-implementation themes that emerged for participant responses of "barriers to following ASA-APA guidelines" included short length of hospital stays, limited time due to clinical pace, minimal patient and guardian education, patient refusals and limited communication with out patient providers.

Discussion

Implementing a metabolic monitoring policy, based on ADA-APA guidelines, demonstrated significant improvement in clinician monitoring adherence and follow-up discharge recommendations for pediatric patients prescribed SGA medication.

Using ADA-APA guidelines, the monitoring policy developed for this project outlined the following eight metabolic parameters for measurement: history of disease, blood pressure, height, weight, BMI, fasting blood glucose, fasting lipid panel and waist circumference. For patients prescribed SGA on admission, metabolic monitoring improved for five of the eight parameters measured. Improved monitoring parameters included: fasting blood glucose, fasting

lipid panel, waist circumference, blood pressure and BMI. Fasting blood glucose and fasting lipid panel monitoring both significantly improved (0% to over 72%) with both demonstrating strong effect size (Phi = .714). Waist circumference monitoring also significantly improved (0% to over 62%) with strong effect size (Phi = .627). Monitoring of blood pressure improved (90% to over 96%), as did BMI monitoring (32% to over 52%) however, neither was found to be statistically significant. Parameter measurement for history, height and weight were all noted to be 100% for both time points, which was expected given these parameters are long-standing general parameters always collected for all patients on admission for hospitalization.

Metabolic parameters measured for patients prescribed new SGA trial during hospitalization included fasting blood glucose, fasting lipid panel and waist circumference. Monitoring adherence for all three parameters improved. Waist circumference improved significantly (0% to 100%). Fasting glucose monitoring improved (29% to 100%) and fasting lipid panel improved (43% to 100%). Although fasting blood glucose and fasting lipid panel did not result significant improvement, the improvement is noted to be clinically relevant. Discharge recommendations for follow-up metabolic monitoring for patients prescribed SGAs significantly improved (13% to over 69%) with moderate to strong effect size (Phi = .559).

While less than robust return rates were seen for the Likert scale survey and questions (66.7%), improvement was seen in clinician's perceived importance of and barriers to evidence-based guidelines for metabolic monitoring. Most Likert Scale responses were "Very Important or Extremely Important" for most of the questions. The most common themes associated with facilitators to following ADA-APA guidelines included: improving patient monitoring and outcomes; and electronic health record capable of automated set orders for metabolic monitoring. The most common themes associated with barriers to following ADA-APA guidelines included: time limitations related to short lengths of stay and rapid clinical pace; and patient's declining to allow venipuncture / law draw during hospitalization.

Sustainability

Results of this quality improvement project and the metabolic monitoring protocol will be presented to the psychiatry department and submitted to the clinical services executive team (CSEC) within the practice setting. The CSEC review process will be necessary to gain approval for operationalizing the monitoring protocol. With CSEC approval, a policy will be developed and the metabolic monitoring protocol will be incorporated into the existing clinical care practice policies. This, then will be considered the clinical expectation for metabolic monitoring of pediatric patients who are prescribed SGA medication.

Nursing Practice Implications

Specific focus on implementing an educational intervention to increase clinician awareness and establishing a structured protocol shows significant impact for improving standard of care for pediatric patients who are prescribed SGA medication. In addition, establishing a protocol that initiates monitoring at time of admission has the potential to positively impact recommendations for follow-up monitoring at time of discharge from hospitalization, thereby strengthening continuity of care for the pediatric population. In doing so, children and adolescents prescribed SGA medications will receive enhanced quality care related to metabolic monitoring that is in keeping with best practice guidelines, regardless of the clinical treatment setting.

Project Design Strengths and Limitations

Strengths associated with this project include the relatively small clinical setting and high level of buy in from both executive and clinical leadership. Additional strengths include the contribution of project results to existing literature associated with monitoring adherence and improvement of metabolic monitoring for pediatric patients prescribed SGA medication. This scholarship serves as a foundation for exploration of additional QI interventions and projects.

Limitations associated with this project include time constrictions for implementation of the project and limited opportunity for follow-up related to continued evaluation of outcomes. Another limitation identified includes the clinical setting's pending transition from pen-and paper charting system to an electronic health record during the implementation phase of the project. A less than robust return rate for Likert Scale survey and questions and anonymous responses prevented comparison for statistical analysis. These were also considered to be limitations.

Project Products

This project should culminate in many professional deliveries. This project will serve as the formal Doctoral defense presentation required for successful conferral of the Doctor of Nursing Practice degree from the University of Virginia. This project will add to the current body of literature related to clinical outcomes of adherence and improvement of metabolic monitoring of children and adolescents prescribed SGA medications. This scholarship will be disseminated to professional organizations and conferences. This project will also be translated into manuscript format for submission to at least one professional nursing journal for publication. *Journal of the American Psychiatric Nurses Association* is the journal selected for submission of the transcript (See Appendix 4 for author guidelines and Appendix 5 for manuscript).

Conclusions

The prevalence of SGA utilization in the pediatric population combined with continued lag in consistent and adequate metabolic monitoring, establishes the need for continued efforts and interventions to improve adherence and standards of care. The implementation of a MMP based on ADA-APA guidelines for pediatric patients prescribed SGA medication was associated with both improved monitoring adherence during hospitalization and improved follow-up recommendations for metabolic monitoring at time of discharge. This project highlights the potential for optimizing positive impacts related to QI initiatives in enhancing quality of care and

outcomes associated with metabolic monitoring SGA use for pediatric patients while strengthening continuity of care across clinical settings. Future considerations should include exploring collaborative approaches for metabolic monitoring between disciplines to include outpatient providers and processes involved in transitioning from pen and paper orders to automated set orders for metabolic monitoring when SGA medication is prescribed. Additional future considerations should also include the incorporation of education for patients and guardians and the inclusion of the social work discipline to optimize communication between in-patient and outpatient providers of pediatric patients prescribed SGA medication.

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Definitions of Terms

Cardiometabolic Risk: Refers to the chance of having diabetes & heart disease-factors often associated with HTN, hyperglycemia, dyslipidemia, elevated BMI, excess waist circumference & obesity.

Discharge Follow-up Metabolic Monitoring Recommendations: Continued metabolic monitoring of parameters at designated time points specific to patients prescribed SGAs, according to ADA-APA guidelines (baseline, 4, 8, & 12-wks, quarterly, annually & every 5 years).

First-Generation Antipsychotic (FGA): Also known as "typical antipsychotic", older medication used to effectively treat the positive symptoms associated with psychosis but associated with dopamine affinity & extrapyramidal symptoms (EPS).

Metabolic Dysregulation: Impairment or abnormality in the parameters & factors associated with the normal metabolic process.

Metabolic Monitoring: Measuring specific of parameters at designated time points according ADA-APA guidelines.

Metabolic Syndrome (Child-specific): Central obesity plus 2 of the 4 following criteria: Hypertension, Impaired glucose, Elevated triglycerides, Low HDL

Prolonged Hospitalization: Pediatric patients requiring in- patient hospitalization longer than 4 weeks.

Second-Generation Antipsychotic (SGA): Also known as "atypical antipsychotic", newer medication used to treat positive and negative symptoms associated with psychosis but more serotonin affinity therefore less EPS; also used as adjunct to antidepressant for mood stabilization.

Table 1

Articles Related to Metabolic Monitoring for Second-Generation Antipsychotic Medications

Reference	Design	Subjects	Setting	Period of Data Collection	Intervention Control / Comparison	Outcomes	Quality / Bias Risk
Ghate, et. al. (2012)	Retrospective Cohort Study	n = 2,038 12-19 years	Primary Care Setting	January 2004- July 2009	Baseline & F/U metabolic measurements for SGA tx compared to no SGA tx	SGA tx resulted in significant weight gain & metabolic symptoms	Level III-A: RX orders tracked vs filled, PCP setting, missing data.
Javaheri & McLennan (2019)	Secondary Data Analysis	n = 47 <18 years-Mean age 14 years	Out-patient Ped Clinic for ID pts	September 2016- November 2017	Evaluate extent of adverse effects related to SGA use.	Significant gaps in adverse monitoring.	Level III-B: small n, specialized clinic-effects generalizability.
Kauffman, Delate, & Botts (2017)	Retrospective Cohort Analysis	n = 40 Children-5 years and younger	25 Ambulatory Clinics	January 2002- June 2011	Identify rates of recomm for metabolic monitoring before & after SGA tx.	Baseline & follow-up metabolic monitoring was poor.	Level III-B: small n, unable to assess family understanding & barriers.
Minjon, et al. (2018)	Retrospective Data Analysis	n = 59 Mental Health Professionals prescribing antipsychotic medications to patients <18 years	Various settings	November 2016	Designed questionnaire for health professionals regarding monitoring youth tx with antipsychotic meds.	All providers reported metabolic monitoring, great variability was found in reported monitoring.	Level III-B: small n, social/prof desirability of respondents at conference may be more of guidelines may lead to bias.
Nolt, et al. (2017)	Retrospective Data Analysis	n = 243 Under 18 years-Mean age 13.1 years	In-patient Pediatric Psychiatric Hospital	November 2013- April 2014	Characterize SGA in-pt prescribing & metabolic parameter monitoring compared to out-pt.	Rates of monitoring for in-pts was higher than out-pt monitoring	Level III-A: unable to access outside labs.
Raebel, et. al., (2014)	Retrospective Cohort Study	n = 16,304 2-18 years	Multiple sites (10)	January 2006- December 2011	Assessed adherence to baseline fasting glucose &/or A1c; no control group.	Few children starting SGAs receive baseline glucose assessment.	Level III-A: labs only available for subset of pts resulting in lower rates but partner dataset rates were also low.
Rodday, et. al., (2015)	Retrospective Data Analysis	n = 308 Child psychiatrists prescribing SGAs to patients 3-18 years	Various settings	February 2012- March 2012	Provided survey to determine if provider characteristics were associated with metabolic monitoring behaviors.	Inconsistent monitoring patterns for children taking SGAs.	Level III-B: low response rate & inability to compare respondents vs non-respondents. Unable to compare reports to practies-bias.
Ronsley, et al. (2012)	Retrospective Cross-sectional	n = 1,114 <18 years- Mean age 11.8	Community-based mental health clinics	September 2009- April 2010	Initiated metabolic monitoring program for SGA tx; no control group.	Significant improvement in monitoring rates.	Level III-B: unable to control variables that may influence changes, unable to establish were lower overtime.
Wakefield, et al. (2019)	Retrospective Data Analysis	n = 149 5-18 years	Out-patient PCP psychiatric clinics	July 2013- December 2014	Comparison of metabolic monitoring behaviors of psychiatrists & PCPs	No significant differences noted except higher rate of BS monitoring by PCPs.	Level III-B: small n, missing data in some charts without sufficient rationale.

Table 2

Guidance Documents related to Metabolic Monitoring for Second-Generation Antipsychotic Medication

Reference	Element	Relevance
ADA-APA (American Diabetes Association- American Psychiatric Association) (2004)	Consensus Statement: Antipsychotic Drugs & Obesity & Diabetes	Establishes relationship between SGAs, Obesity & Diabetes. Provides recommendations for monitoring & treatment.
CAMESA (Canadian Alliance for Monitoring Effectiveness & Safety of Antipsychotics in Children) (2009)	Evidence-Based Guidelines	Evidence-based guidelines for monitoring safety of SGAs in children.
Panagiotopoulos, et al. (2010)	Physician Handbook	Guidelines for metabolic monitoring with SGA use. Parameters & assess tools.
American Academy of Child & Adolescent Psychiatry (2011)	Practice Parameters	Recommendations for use & management of antipsychotics in children.

Table 3

ADA-APA Consensus Metabolic Monitoring Protocol for Patients on SGAs

	Baseline	4 Weeks	8 Weeks	12 Weeks	Quarterly	Annually	Every 5 Years
Personal/Family History	X					X	
Weight (BMI)	X	X	X	X	X		
Waist Circumference	X					X	
Blood Pressure	X			X		X	
Fasting Plasma Glucose	X			X		X	
Fasting Lipid Profile	X			X			X

Table 4

Admissions for Hospitalization (*N* = 87)

	N (%)
Pre-Implementation	37 (42.53)
Post-Implementation	50 (57.47)

Table 5

Demographics & Second Generation Antipsychotic Use: Pre-Implementation and Post-Implementation (N=87)

	Pre N=37	Post N=50	Sig.
Patient Age in years Median (IQR)	14.00 (12.50-16.00)	15.50 (13.00-17.00)	.117[1]
SGA on Admission N (%)	19 (51.4)	29 (58.0)	.538[2]
New SGA Trial N (%)	7 (18.9)	4 (8.0)	.192[3]

1=Independent Samples Mann-Whitney U Test
2=Chi-Square Test
3=Fisher's Exact Test

Table 6

Second-Generation Antipsychotic Use on Admission: Pre-Implementation and Post-Implementation Parameter Measures (N = 48)

Parameter	Pre N=19	Post N=29	Sig.
Age in years Median (IQR)	14.00 (13.00 – 15.00)	16.00 (13.00 – 17.00)	1.33[1]
SGA Use on Admission N (%)			
Personal / Family History	19 (100.0)	29 (100.0)	-
Blood Pressure	17 (89.5)	28 (96.6)	.554[2]
Height	19 (100.0)	29 (100.0)	-
Weight	19 (100.0)	29 (100.0)	-
Body Mass Index	6 (31.6)	15 (51.7)	.169[3]
Fasting Glucose	0 (0.00)	21 (72.4)	< .001[3]
Fasting Lipid Panel	0 (0.00)	21 (72.4)	< .001[3]
Waist Circumference	0 (0.00)	18 (62.1)	< .001[3]

1=Independent Samples Mann-Whitney U Test
2=Chi-Square Test
3=Fisher's Exact Test

Table 7

New Second-Generation Antipsychotic Trial: Pre-Implementation and Post-Implementation Parameter measures (N=11)

Parameter	Pre N=7	Post N=4	Sig.
New SGA Trial			
Fasting Glucose	2 (28.6)	4 (100.0)	.061[1]
Fasting Lipid Panel	3 (42.9)	4 (100.0)	.194[1]
Waist Circumference	0 (0.0)	4 (100.0)	< .003[1]

1=Fisher's Exact Test

Table 8

Discharge Recommendations for Follow-up Metabolic Monitoring: All Second Generation Antipsychotic Use (N = 56)

	Pre N=23	Post N=33	Sig.
Discharge Recommendations N (%)	3 (13.0)	23 (69.7)	< .001[1]

1=Fisher's Exact Test

Table 9

Likert Scale Survey Results: Pre-Implementation and Post-Implementation Metabolic Monitoring for Pediatric Population Prescribed Second-Generation Antipsychotic Medication

Question	Level	Pre N=6 N (%)	Post N=6 N (%)
Do you think metabolic monitoring of pediatric patients prescribed SGAs is important?	Extremely Important	5 (83.0)	5 (83.0)
	Very Important	1 (17.0)	1 (17.0)
	Neutral	0 (0.0)	0 (0.0)
	Low Importance	0 (0.0)	0 (0.0)
	Not At All Important	0 (0.0)	0 (0.0)
Do you think following best practice guidelines for metabolic monitoring of pediatric patients prescribed SGAs is important?	Extremely Important	2 (33.0)	5 (83.0)
	Very Important	3 (50.0)	1 (17.0)
	Neutral	1 (17.0)	0 (0.0)
	Low Importance	0 (0.0)	0 (0.0)
	Not At All Important	0 (0.0)	0 (0.0)
Do you think following best practice guidelines for metabolic monitoring of patients prescribed SGAs is important in this practice setting?	Extremely Important	2 (33.0)	1 (17.0)
	Very Important	3 (50.0)	4 (67.0)
	Neutral	1 (17.0)	1 (17.0)
	Low Importance	0 (0.0)	0 (0.0)
	Not At All Important	0 (0.0)	0 (0.0)
Do you think it is important to use a collaborative approach for metabolic monitoring of pediatric patients prescribed SGAs?	Extremely Important	0 (0.0)	2 (33.0)
	Very Important	6 (100.0)	4 (67.0)
	Neutral	0 (0.0)	0 (0.0)
	Low Importance	0 (0.0)	0 (0.0)
	Not At All Important	0 (0.0)	0 (0.0)
Do you think follow-up metabolic monitoring of pediatric patients prescribed SGA is important?	Not At All Important	2 (40.0)	5 (83.0)
	Low Importance	3 (60.0)	1 (17.0)
	Neutral	0 (0.0)	0 (0.0)
	Very Important	0 (0.0)	0 (0.0)
	Extremely Important	0 (0.0)	0 (0.0)

Figure 1

PRISMA 2009 Flow Diagram

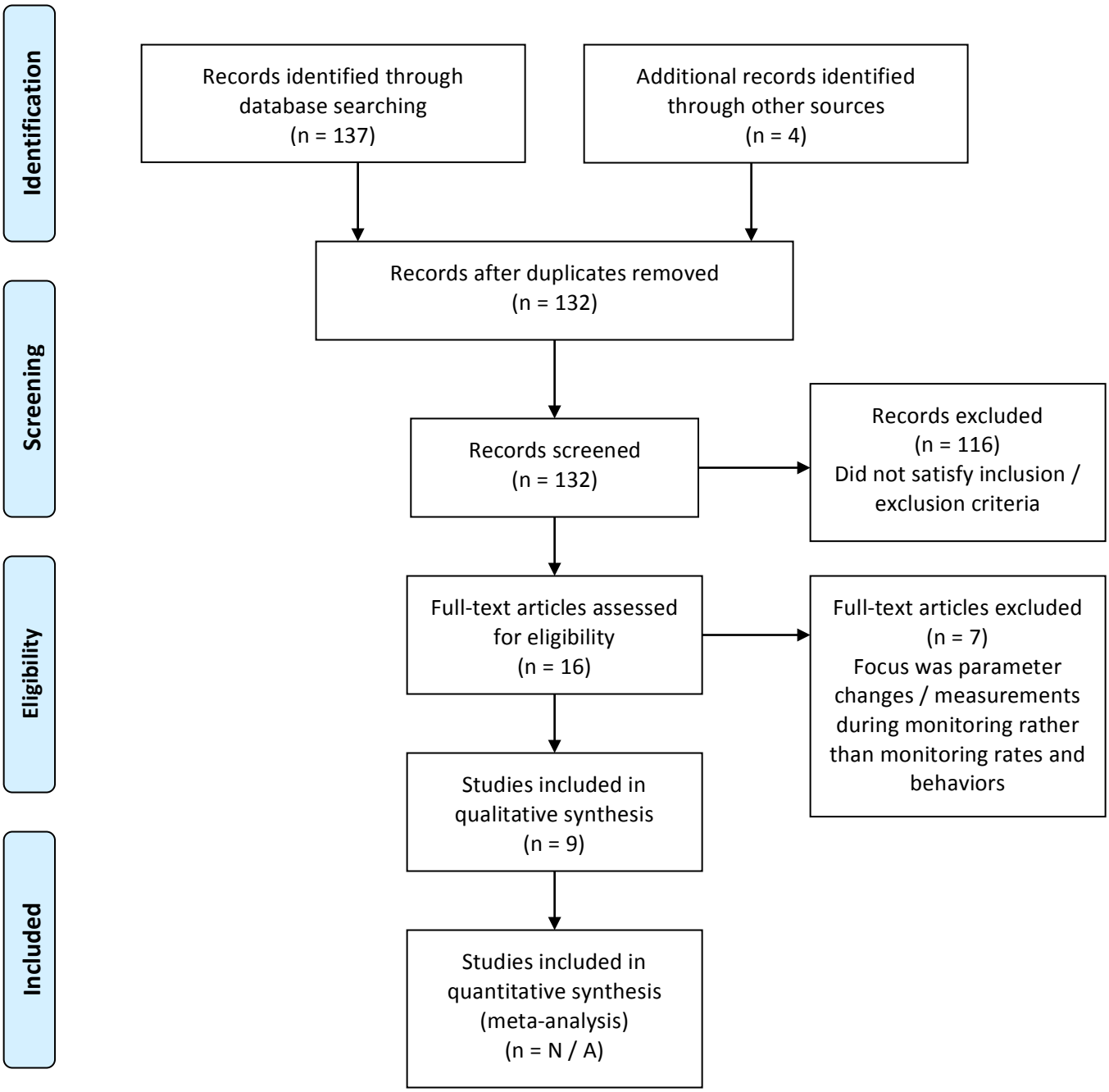


Figure 2

The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

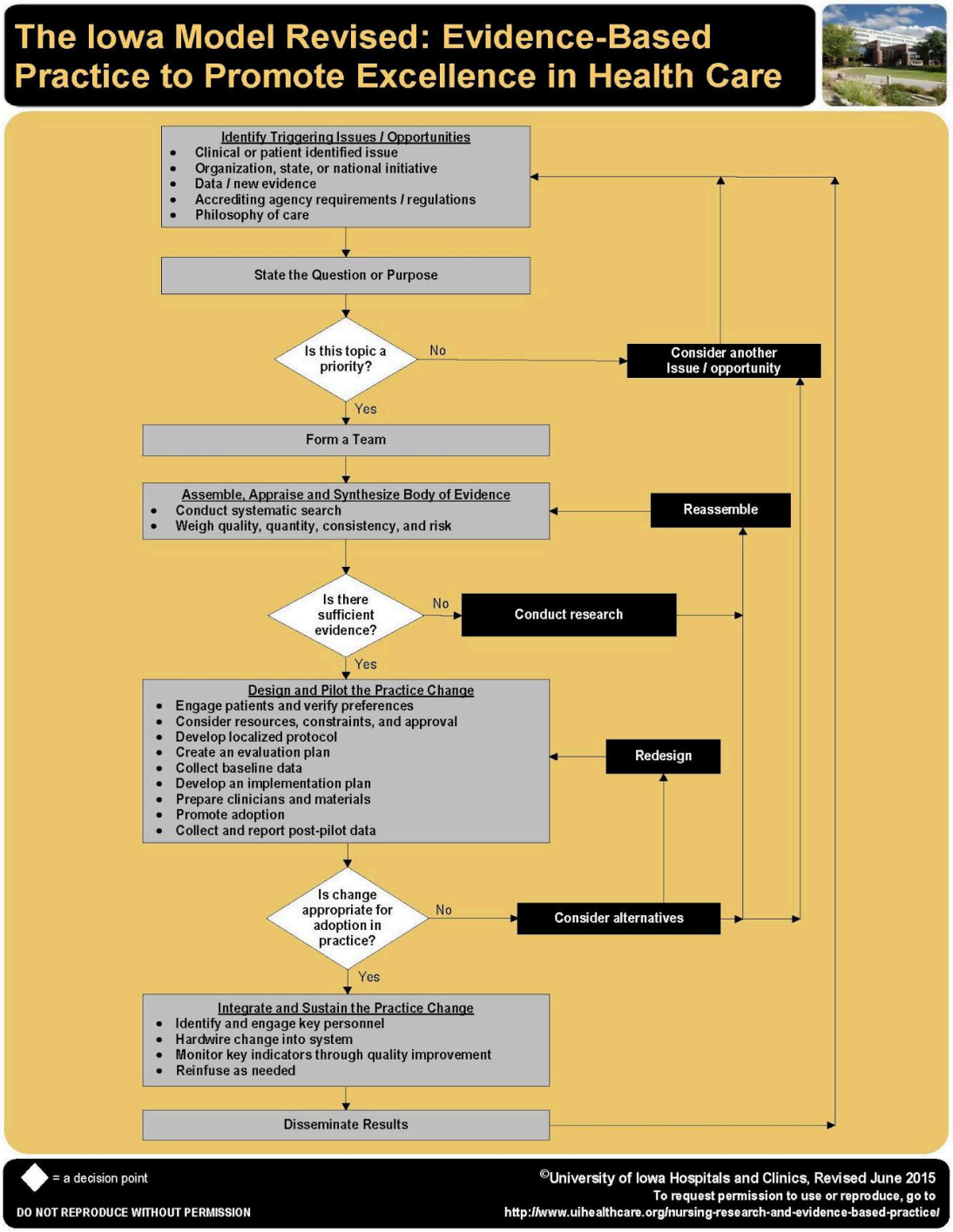


Figure 3

Lewin's Change Theory of Nursing Model

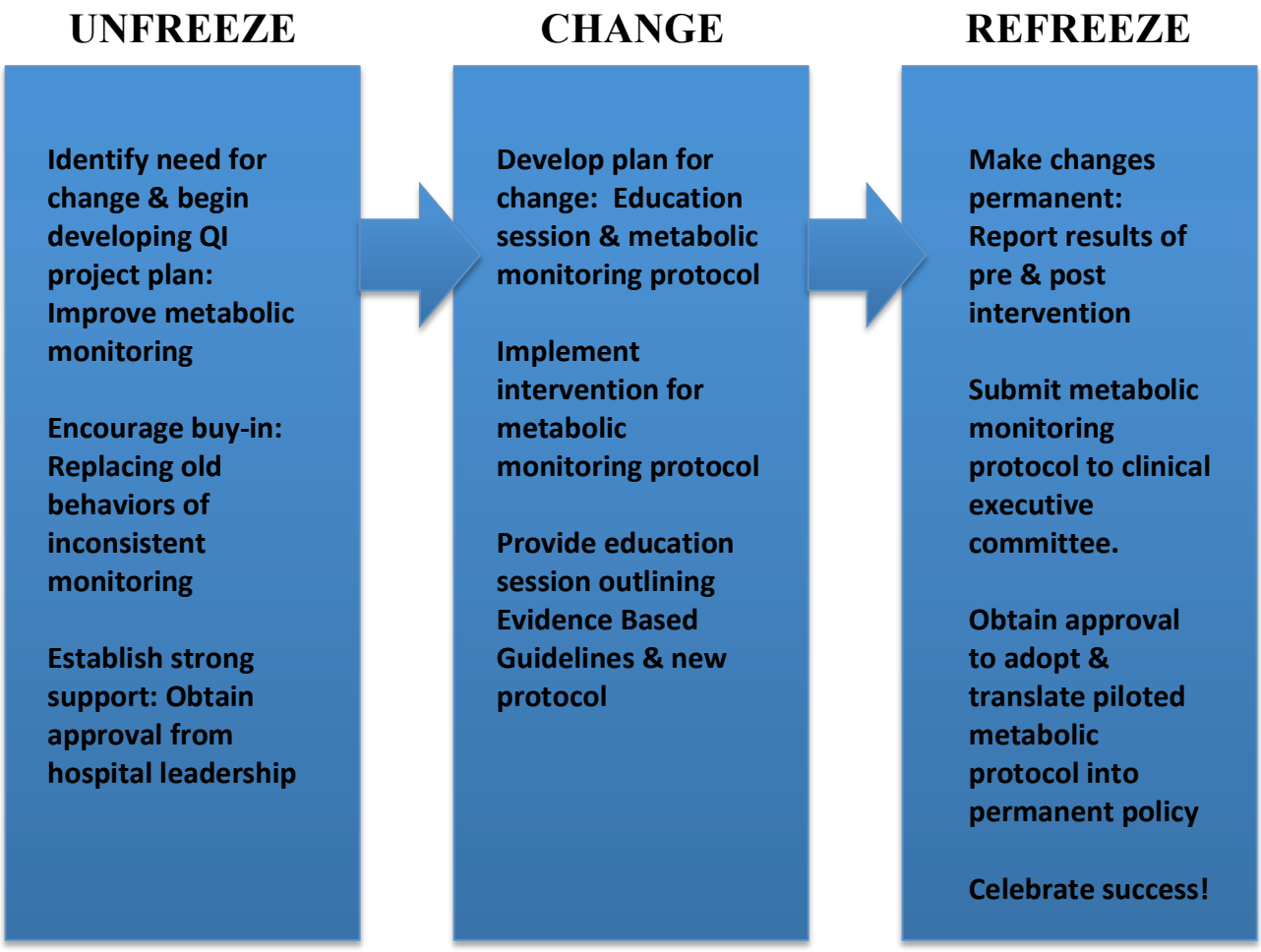


Figure 4

Plan-Do-Study-Act Model

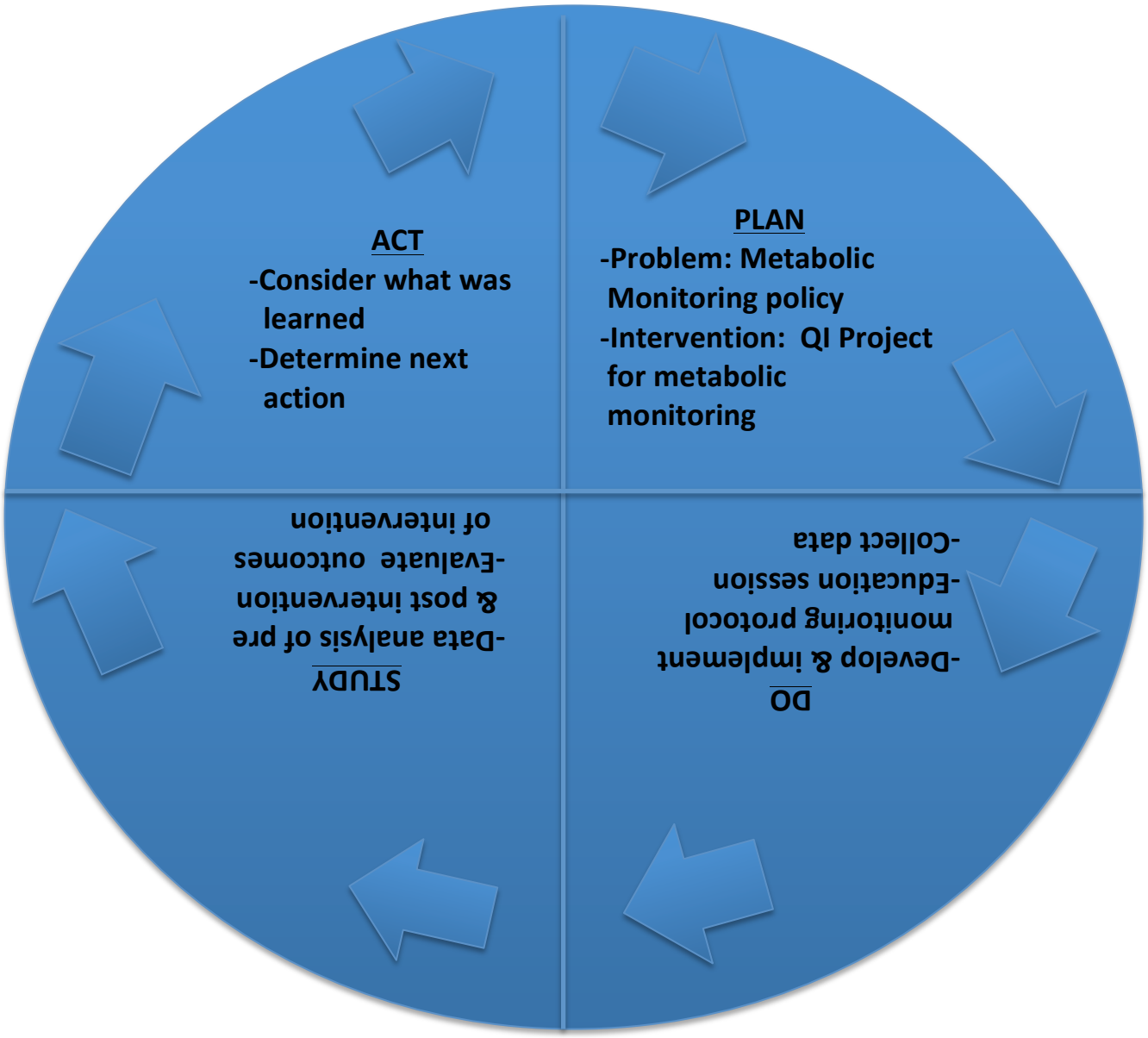


Figure 5

Metabolic Monitoring Protocol for SGA Use

Purpose: To provide protocol and procedure for metabolic monitoring of patients prescribed second-generation antipsychotic medication(s) based on best practice guidelines and practice parameters by ADA-APA and AACAP.

Applicability: Prescribing Clinicians (Physicians, Nurse Practitioners)

Protocol: Metabolic monitoring will be ordered for all patients prescribed SGA medication. Patients meeting criteria for ordering baseline metabolic monitoring include:

a. Patients already prescribed SGA medication on admission
b. Patients newly prescribed SGA medication during hospitalization

Procedure:

1. **Monitoring protocol parameters will include:**
   a. Patient / family history
   b. Weight and BMI
   c. Waist Circumference
   d. Blood pressure
   e. Fasting blood glucose
   f. Fasting lipid panel

2. **Patient / family history, height & weight with BMI, and blood pressure parameters are already obtained during the initial assessment.** This process will remain the same and will not change.

3. **Patients newly admitted:** within 24 hours of admission, accompanying documentation will be reviewed to determine if waist circumference, fasting blood glucose and fasting lipid panel has been included. If these measures cannot be found within the accompanying documentation, baseline monitoring should be initiated. The process will be to provide a verbal or written order on the physician's order sheet to include:
   a. baseline waist circumference
   b. fasting blood glucose
   c. fasting lipid panel

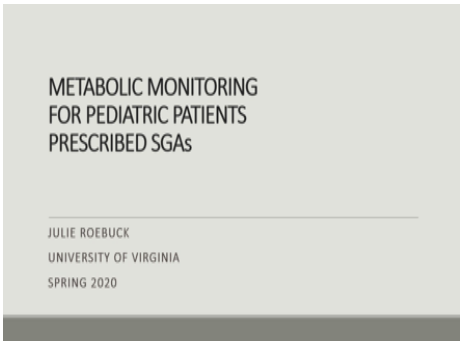
4. **Patients newly initiated on SGA during hospitalization:** at time SGA is initiated, baseline metabolic monitoring protocol will also be initiated. The process will be to provide a verbal or written order on the physician's order sheet to include:
   a. baseline waist circumference
   b. fasting blood glucose
   c. fasting lipid

5. **Patients with more prolonged hospitalizations:** following guidelines for continued metabolic monitoring will be applicable. This process will be to provide a verbal or written order on the physician's order sheet to include:
   a. height and weight with BMI at 4 weeks post-baseline measures
   b. repeat this measure at 4-week intervals during hospitalization

Please attached ADA-APA guidelines as additional reference

Figure 6

Power Point Education Session



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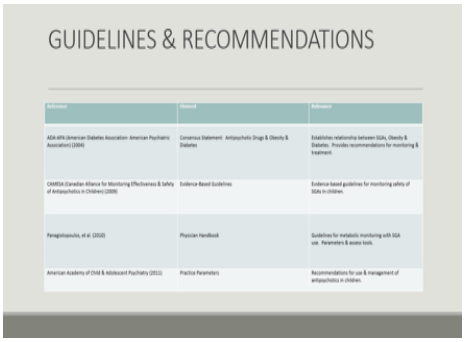

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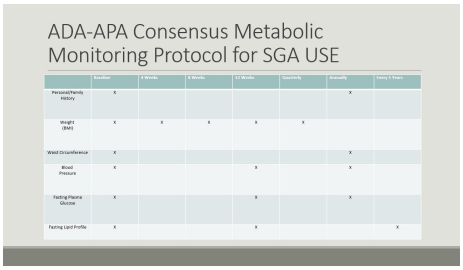

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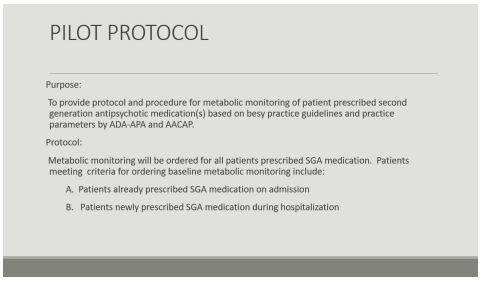

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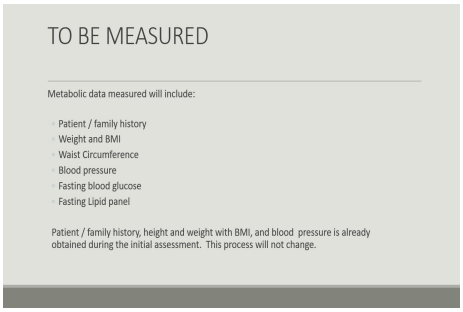

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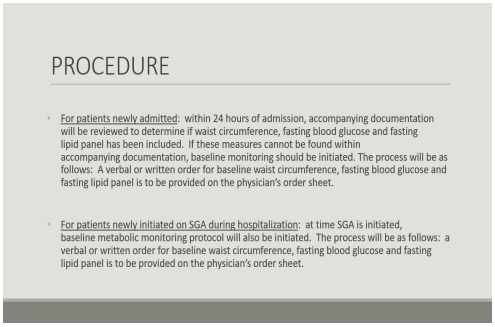

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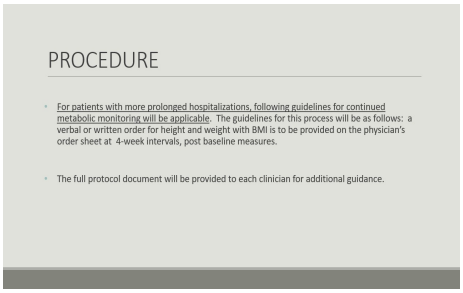

Slide 7

Figure 7

Likert Scale Survey & Questions

Part I: Below are questions related to metabolic monitoring of pediatric patients prescribed second-generation antipsychotic medication(s). Please indicate the extent of importance for each question.

Please use the following scale:

1 = Not At All Important
2 = Low Importance
3 = Neutral
4 = Very Important
5 = Extremely Important

Questions	Not At All Important	Low Importance	Neutral	Very Important	Extremely Important
	1	2	3	4	5
Do you think metabolic monitoring of pediatric patients prescribed SGAs is important?					
Do you think following best practice guidelines for metabolic monitoring of pediatric patients prescribed SGAs is important?					
Do you think following best practice guidelines for metabolic monitoring of patients prescribed SGAs is important in this practice setting?					
Do you think it is important to use a collaborative approach for metabolic monitoring of pediatric patients prescribed SGAs?					
Do you think follow-up metabolic monitoring of pediatric patients prescribed SGA is important?					

Part II:

- Please list 3 facilitators to following ADA-APA guidelines for metabolic monitoring:
  1.
  2.
  3.

- Please list 3 barriers to following ADA-APA guidelines for metabolic monitoring:
  1.
  2.
  3.

Figure 8

Chart Audit Data Form

CHART	UNIT	ADMISSION DATE	DISCHARGE DATE	SGA USE	METABOLIC MONITORING ON ADMISSION	METABOLIC MONITORING FOR NEW SGA	METABOLIC MONITORING FOR PROLONGED HOSPITALIZATION	METABOLIC MONITORING DISCHARGE RECOMMENDATION
Number of Chart by Admission Age: ___yrs ___mos	Unit Admitted 1 2 3 4	Date of Admission ___/___/___	Date of Discharge ___/___/___	Yes or No	Personal / Family History Height / Weight (BMI) Waist Circumference Blood Pressure Fasting Blood Glucose Fasting Lipid Profile	Waist Circumference Fasting Blood Glucose Fasting Lipid Profile	Height / Weight (BMI)	Yes or No
Number of Chart by Admission	Unit Admitted 1 2 3 4	Date of Admission ___/___/___	Date of Discharge ___/___/___	Yes or No	Personal / Family History Height / Weight (BMI) Waist Circumference Blood Pressure Fasting Blood Glucose Fasting Lipid Profile	Waist Circumference Fasting Blood Glucose Fasting Lipid Profile	Height / Weight (BMI)	Yes or No
Number of Chart by Admission	Unit Admitted 1 2 3 4	Date of Admission ___/___/___	Date of Discharge ___/___/___	Yes or No	Personal / Family History Height / Weight (BMI) Waist Circumference Blood Pressure Fasting Blood Glucose Fasting Lipid Profile	Waist Circumference Fasting Blood Glucose Fasting Lipid Profile	Height / Weight (BMI)	Yes or No
Number of Chart by Admission	Unit Admitted 1 2 3 4	Date of Admission ___/___/___	Date of Discharge ___/___/___	Yes or No	Personal / Family History Height / Weight (BMI) Waist Circumference Blood Pressure Fasting Blood Glucose Fasting Lipid Profile	Waist Circumference Fasting Blood Glucose Fasting Lipid Profile	Height / Weight (BMI)	Yes or No
	Unit Admitted 1 2 3 4	Date of Admission ___/___/___	Date of Discharge ___/___/___	Yes or No	Personal / Family History Height / Weight (BMI) Waist Circumference Blood Pressure Fasting Blood Glucose Fasting Lipid Profile	Waist Circumference Fasting Blood Glucose Fasting Lipid Profile	Height / Weight (BMI)	Yes or No
	Unit Admitted 1 2 3 4	Date of Admission ___/___/___	Date of Discharge ___/___/___	Yes or No	Personal / Family History Height / Weight (BMI) Waist Circumference Blood Pressure Fasting Blood Glucose Fasting Lipid Profile	Waist Circumference Fasting Blood Glucose Fasting Lipid Profile	Height / Weight (BMI)	Yes or No

Data collection from this chart audit data form will be transferred to Excel Spreadsheet

Figure 9

Metabolic Monitoring Form for Second-Generation Antipsychotic Medications

Patient Name: Patient and family history obtained: Yes or No

Date	Parameter	Results
	Blood Pressure	
	Height	
	Weight	
	BMI	
	Waist Circumference	
	Fasting Glucose	
	Fasting Lipid Panel • High-density liproprotein (HDL) • Low-density liproprotein (LDL) • Total Cholesterol (TC) • Triglycerides (TG)	HDL: _____ LDL: _____ TC: _____ TG: _____

Additional Note(s):

_____ Follow-up outpatient metabolic monitoring is recommended.

_____ _____

Provider Signature Date

Appendix 1

COMMONWEALTH OF VIRGINIA

Jaime Bamford, MD
Director

P.O. Box 4000 Staunton, Virginia 24402-4000
Telephone (540) 332-2100 www.ccca.dbhds.virginia.gov

Department of Behavioral Health and Developmental Services

Commonwealth Center for Children & Adolescents

May 14, 2020

Karen Mills, UVA-IRB

Dear Ms. Mills:

As director of the Commonwealth Center for Children and Adolescents, I give permission for Julie Roebuck, PMHNP to conduct a quality improvement project for metabolic monitoring. We are hopeful this information will be helpful in improving the quality of care provided at CCCA.

Sincerely,

Jaime Bamford, MD Facility Director

cc: Julie Roebuck, PMHNP

Appendix 2

IRB Email

From: Mills, Karen Coleman (kcm6t) <kcm6t@virginia.edu>
Sent: Wednesday, May 20, 2020 9:39 AM
To: Roebuck, Julie H (jah3t) <jah3t@virginia.edu>
Subject: FW: Quality Improvement Project for Metabolic Monitoring 0IRBHSR TRACKING ID 22380

Good morning,

The IRBHSR QI Committee has determined that this project as described does not meet the criteria for Human Subject Research. This is a QI project. No additional IRB submission/review is necessary for you to proceed with this project. Please refer to the attached IRB signed Determination (see PDF) for additional information.

Your project was assigned IRB Tracking Id # 22380. This tracking ID has been added to the project documents attached.

The information you will be recording for your project meets the criteria of Limited Dataset under HIPAA. Please complete Appendix E of the application attached and file with your project files.

This project was determined to be a QI project. The results may only be published as QI and not as human subject research.

Please keep this email and all attached documents with the project files.

Contact the IRB if anything with this project changes that might affect the non-human subject determination OR if you have questions or concerns.

Thanks,
Karen

Karen Coleman (Mimms) Mills, RN
Compliance Coordinator
IRB-HSR Board Member
Institutional Review Board-Health Sciences Research
434-964-7666
This number is Not a UVA number – dial full 7 digits OR if outside the 434 area code dial all 10 digits
OFFICE HOURS: M--F 08:00 - 12:00

Appendix 3

Subject: Psychiatry Meeting: Metabolic Monitoring for SGAs - QI Project

Subject: Psychiatry Meeting

Date: June 2, 2020 at 2 pm - Main Conference Room

Topic: Metabolic Monitoring Project for Second Generation Antipsychotics (SGAs)

Your attendance is requested for an upcoming CCCA psychiatry meeting scheduled for June 2nd at 2 pm - in the main conference room. For those unable to be physically present, a conference line will be provided to help facilitate remote participation. Discussion will include the review of a metabolic monitoring quality improvement project intended to enhance metabolic monitoring of CCCA patients prescribed SGA medication. A pilot protocol for metabolic monitoring will be presented and the step-by-step process will be outlined. The meeting will last approximately 45 minutes and time will allow for questions and answers.

The pilot protocol / procedure for metabolic monitoring of CCCA patients prescribed SGAs will be implemented on Monday, June 8th.

Your presence or remote participation during this meeting is strongly encouraged. Should you not be able to attend or participate remotely, please contact me directly to schedule a specific time that will allow me to meet with you individually.

Sincerely,

Julie Roebuck, PMH-NP, BC
UVA Doctoral Student

Conference Line:

Dial: 866-845-1266
Passcode: 85788223#

Please see the following attachments:

Metabolic Monitoring Protocol
Powerpoint Presentation
Likert Scale Survey & Questions

Appendix 3 (Continued)

Date: 6/18/2020

Hello All,

Just wanted to quickly check in to see if there are any questions about the project for metabolic monitoring of SGA use. I plan to be at CCCA for a few hours on most days during the week and will be available to answer any questions you may have. Also, feel free to communicate with me via this email or cell (434-962-7964). Additional copies of all documents remain located in Tonya Eustler's office. Please complete the Likert Scale survey & return to me by email or you may place your completed survey in the designated folder marked "Likert Scale Survey" (also in Tonya's office). Thank you in advance for your participation.

Thank you,

Julie Roebuck, PMH-NP, BC

Date: 6/26/2020

Dear All,

Just a quick note to see if there have been any issues or difficulties related to the new metabolic monitoring protocol for SGA use. As a reminder, the project effective dates: June 8th through July 9th. Please feel free to contact me if you have any questions or feedback that you would like to share. Again, I'm very appreciative of your support of and participation in this project. Also, thank you to all who have completed the Likert Scale & questions form. If you have not done this yet, I would like to again request that you complete and return to Tonya Eustler's office-as it is a very important aspect of this project. I look forward to sharing my results with you following completion of the project.

Sincerely,

Julie Roebuck, PMH-NP,BC

Appendix 4

Manuscript Author Guidelines

Journal of the American Psychiatric Nurses Association

SAGE Publishing disseminates high-quality research and engaged scholarship globally, and we are committed to diversity and inclusion in publishing. We encourage submissions from a diverse range of authors from across all countries and backgrounds.

The Journal of the American Psychiatric Nurses Association is a professional, double-blind peer-reviewed journal that welcomes original articles in English. The Journal publishes research and other scholarly works designed to provide new knowledge that is clinically relevant to psychiatric nurses and to inform psychiatric nurses and others about significant issues in mental health/psychiatric care. We invite submissions of manuscripts relevant to psychiatric nursing that describe critical and timely analysis of emerging issues and trends, and discuss innovative models of practice as they relate to changing systems of health care. Types of manuscripts published include: Original Research Reports, Review Articles, Quality Improvement Manuscripts, Discussion Papers, Brief Reports, Book Reviews, and Letters to the Editor.

MANUSCRIPT PREPARATION

Organization and Basic Formatting of the Manuscript

- Prepare ALL manuscripts using the style and standards outlined in the Publication Manual of the American Psychological Association (APA), 6th edition.
  - Use 12-point font and one-inch margins at the top, bottom, right, and left.
  - Double-space all pages, including the abstract, text, references, tables, and legends.
  - All abstracts should be no more than 250 words.
  - Number pages consecutively beginning with the title page.
  - Include a running head (shortened version of the title) at the top of each page to identify the manuscript. The running head must not contain any author names or initials.
- IMPORTANT-Manuscript files uploaded for review should NOT include any of the authors' names or institutional affiliations to facilitate blind peer review. For Military/VA Authors: Please refer to your organization's publication submission policy/process and include a copy of publication approval from your organization.
- Please complete the Authorship Contribution Statement available here and in the Instructions and Forms on the JAPNA submission site, and submit this with the manuscript.

Main Document

The main document should include:

1 Title, abstract, and key words(first page)
2 Manuscript text (begin on new page - page 2)
3 References (begin on a new page)
4 Tables and table captions (begin each table on a new page)
5 Figure captions (begin each figure caption on a new page). Figure files should be uploaded as separate files and not be included in the manuscript main document.

Note: Please ensure that no identifying author or institution names are included anywhere in your manuscript so as to facilitate our double-blind peer-review process. Please omit or use XXXX in place of in-text citations and items in the reference list to remove all identifying information. When submitting a revised manuscript, follow the same instructions, but please also upload a clean copy of your manuscript with the in-text citations and authors' items in the reference list reinstated. Designate this clean copy of the manuscript as a Supplementary File when you upload the file. This file will not be shared with reviewers but will be sent to the production team if the paper is accepted for publication.

JAPNA editors welcome the following types of manuscripts:

Original Research Reports: Original research reports include studies of all designs including quantitative, qualitative and mixed methods studies. (Pilot, preliminary, and feasibility studies should be submitted as Brief Reports). All research reports must contain a statement in the methods section about the protection of human subjects and approval by the appropriate institutional review board (IRB). Reports should provide new knowledge for clinical practice and highlight significance for psychiatric nursing. Original articles are limited to 20 pages, exclusive of references, tables and figures. Original research articles are the highest priority for JAPNA.

- For reports of randomized control trials, use the Consolidated Standards of Reporting Trials (CONSORT) Guidelines (http://www.consort-statement.org/). The CONSORT Guidelines provide direction for reporting randomized controlled trials and include a 25-item checklist focused on minimum reporting requirements, and a flow diagram to document the progression of all participants through the trial.

For reports of Observational studies (nonexperimental quantitative research), use the Strengthening the Reporting of Observation studies in Epidemiology (STROBE) Guidelines (https://strobe-statement.org/index.php?id=available-checklists)

- For qualitative studies, the following resources are recommended:
- For a synthesis of recommendations for reporting qualitative research use the Standards for Reporting Qualitative Research (SPQR) (http://www.equator-network.org/reporting-guidelines/srqr/).
- For research involving interviews and focus groups, follow the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (https://www.equator-network.org/reporting-guidelines/coreq/).
- For a checklist of general considerations in reporting qualitative research, see the CASP Qualitative Checklist (http://www.casp-uk.net/casp-tools-checklists).

Suggested headings:

- Introduction
  - Provide an adequate but concise background
  - State the objective(s) of the research in the last paragraph of the introduction
- Methods
  - Include design, setting, participants, ethical considerations, and full details of data collection (including dates the original data were collected) and analysis.
  - Provide support for the adequacy of the sample.
  - For quantitative studies, provide specific evidence for validity of measures.
  - For qualitative studies, describe types of dependability and credibility used and how trustworthiness of qualitative data was assured.
- Results
  - Include pertinent demographic data on the sex, age, and race-ethnicity of the study participants.
  - Report only the findings directly related to the study objectives or research questions.
  - Report sample numbers for all percentages, and report SDs or SEs for all means.
  - When reporting statistically significant results, report test statistic values, degrees of freedom, and probability level (not to exceed $p < .001$; do not use $p = .000$).
- Discussion
  - Discuss the significance of the study findings, without simply repeating them.
  - Include limitations and recommendations.
  - Provide implications for psychiatric nursing practice, policy, and/or research
- Conclusions

Review Articles: Review Articles provide a comprehensive review and critical synthesis of the literature on a specific topic. Types of review manuscripts considered include systematic reviews either with or without meta-analysis, integrative reviews, narrative reviews and reviews and syntheses of qualitative research (e.g., metasynthesis). All reviews should be guided by a clear statement of purpose or research question. The methods section should clearly report data sources, search procedures, article selection process, data extraction, and data synthesis procedures. All reviews require a synthesis of the findings with specific implications for practice, policy, and/or research. Review papers are limited to 25 pages exclusive of references, tables, and figures. Suggested headings within the text include: Background, Objective(s), Methods, Results, Discussion, and Conclusions.

- For systematic reviews and meta-analyses of randomized controlled trials and other types of research, use the Preferred Reporting Items of Systematic reviews Meta-Analyses (PRISMA) Guidelines (http://www.prisma-statement.org/ includes a checklist and flow diagram.
- For systematic reviews of observational studies, use the Meta-analysis of Observational Studies in Epidemiology (MOOSE) Guidelines (http://www.consort-statement.org/Media/Default/Downloads/Other%20Instruments/MOOSE%20Statement%202000.pdf)

- For reviews of qualitative research, see the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) Statement (https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-12-181).

Quality Improvement Manuscripts: Quality improvement (QI) papers are reports of systematic, data-based interventions designed to achieve improvements in the quality, safety, and value of healthcare. Report of QI projects should provide new knowledge with clear implications for psychiatric nursing practice beyond the study site. QI manuscripts are limited to 10 pages, exclusive of references, and no more than 2 tables or figures. The appropriate guideline for reporting a QI research project is the SQUIRE guidelines (http://squire-statement.org/guidelines/). Suggested headings within the text include: Introduction, Methods, Results, Discussion, and Conclusions.

Discussion Papers: JAPNA publishes critical analytical discussion papers addressing conceptual, philosophical, theoretical, methodological or professional phenomena of interest when it is clear that the content represents an extension of knowledge and that the phenomena are relevant to psychiatric nursing. These papers may include analyses of innovations and trends in clinical practice, care delivery systems, education programs, and public policy. They focus on the latest evidence-based information about the presentation, diagnosis, treatment, and management of a particular clinical problem relevant to psychiatric nursing practice. Discussion Papers are limited to 10 pages, exclusive of references, and usually do not contain tables or figures.

Student Manuscripts: JAPNA encourages students and their faculty mentors to carefully review the journal guidelines and the scholarly articles published therein prior to their consideration of submitting a manuscript for review. Authors submitting student projects are advised to review their submissions with their advisors to be sure the manuscripts are ready for submission. The faculty's contribution to the manuscript should be acknowledged in the "Authorship Contribution Statement" described in the ethical guidelines in this document. Student and faculty authorship should be determined according to ICMJE guidelines. Papers that do not meet the journal's professional standards will not be sent out for review. Students and their faculty mentors are strongly encouraged to contact the editorial team prior to the submission of a manuscript for guidance in regards to the suitability of the paper and its adherence to guidelines and standards.

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- A statement describing the funding sources and other acknowledgments or a statement that no funding was received.

Sample Title Page

Title of Manuscript
Authors: Geraldine S. Pearson, Janice H. Goodman, and Kristen Overstreet
Corresponding author
Geraldine S. Pearson, PHD, PMH-CNS, FAAN
Associate Professor, UCONN School of Medicine
Complete mailing address:
263 Farmington Avenue MC1410
Farmington, CT 06030-1410 USA
Business Phone: 1-860-679-4089
Email: gpearson@uchc.edu
Co-Authors
Janice H. Goodman, PhD, PMHCNS-BC, PMHNP-BC,
Professor, MGH Institute of Health Professions, Boston, MA, USA

Kristen Overstreet, BA
Senior Partner, Origin Editorial, Leander, TX, USA
Conflicts of Interest: Geraldine S. Pearson and Janice H. Goodman declare no conflicts of interest with the research or writing of this paper. Kristen Overstreet is Senior Partner of Origin Editorial, which provided funding for this project. She also receives speaking fees for presentations at conferences on the topic of this manuscript.
Funding Statement: This research was supported by a grant from Origin Editorial. No grant number is available.
Author Contributions: GSP and JHG conceived the study and determined the methodology. All three authors collected and analyzed the data. GSP took the lead in writing and organizing the manuscript. JHG wrote the methods section and KO wrote the background section. All three authors reviewed the final manuscript before submitting for publication.
Other Acknowledgments: Geraldine S. Pearson would like to thank the administrations at the hospitals where the data were collected for their support.
Page 1 of submission: Title Page for the manuscript including title, author (in correct order), mailing address, email contact.

For Quality Improvement manuscripts, include an abstract using the following headings: (limit 250 words)
- Introduction
- Aims
- Methods
- Results
- Conclusions

References for All Submissions
Limit references to those that best support the text. Cite references in the text according to the style outlined in the Publication Manual of the American Psychological Association, sixth edition, and format the reference list in APA style. Cite current primary sources only. Include DOI numbers for all sources for which they are available.

References Examples

Reference Type	
Journal Article	Beeber, L., & Stein, K.F. (2015). Federal funding to address the health needs of persons with mental disorders: Why is this population a special case? *Journal of the American Psychiatric Nurses Association, 21,* 306. DOI: https://doi.org/10.1177/1078390315612473
Book	Patton, M.Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.
Online source	World Health Organization. (2016). *Mental health: Strengthening our response.* Retrieved on 5/18/16 from http://www.who.int/mediacentre/factsheets/fs220/en/
Journal article online first	Von Ledebur, S. C. (2007). Optimizing knowledge transfer by new employees in companies. *Knowledge Management Research & Practice.* Advance online publication. Doi:10.1057/palgrave.kmrp.8500141

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CHECKLIST FOR AUTHORS
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- Title page with author contact information, credentials, job titles, affiliations, conflict of interest statement, funding statement, acknowledgments, and a list of each author's role in the writing of the manuscript
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  - Each page has a running head that does not include author names or initials
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- Drafted the article or revised it critically for important intellectual content, AND

- Approved the final version to be published, AND
- Agree to be accountable for all aspects of the work

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Acknowledgements
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Research ethics
We accept manuscripts that report human and/or animal studies for publication only if it is made clear that investigations were carried out to a high ethical standard. Studies in humans which might be interpreted as experimental (e.g. controlled trials) should conform to the Declaration of Helsinki http://www.wma.net/en/30publications/10policies/b3/index.html and manuscripts must include a statement that the research protocol was approved by the appropriate ethical committee based on the geographical location where research was conducted. In line with the Declaration of Helsinki 1975, revised Hong Kong 1989, we encourage authors to register their clinical trials (at http://clinicaltrials.gov or other suitable databases identified by the ICMJE, http://www.icmje.org/publishing_10register.html). If your trial has been registered, please state this on the Title Page. When reporting experiments on animals, indicate on the Title Page which guideline/law on the care and use of laboratory animals was followed.

All studies submitted for publication, including quality improvement studies, should indicate in the methods section of the manuscript either that (a) the study was approved by the IRB of the sponsoring institution, or (b) a formal determination was made by the IRB that the study was exempted from IRB review.

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Appendix 5

Manuscript

Metabolic Monitoring of Pediatric Patients: A Quality Improvement Project

Abstract

INTRODUCTION: The prevalence of psychotropic medication prescription use in youth has increased over the past several years. Despite recommendations and practice parameters established by the American Diabetes Association-American Psychiatric Association (ADA-APA) outlining metabolic monitoring of patients prescribed second-generation antipsychotic (SGA) medication, monitoring adherence for the pediatric patient population remains inadequate. **AIMS:** This project aimed to improve metabolic monitoring of pediatric patients prescribed SGAs and discharge recommendations for follow-up monitoring within a small, child and adolescent psychiatric hospital. **METHODS:** This project compared metabolic monitoring adherence rates pre and post implementation of a metabolic monitoring organizational policy developed to provide procedural guidance, using ADA-APA guidelines. Participants included prescribing clinicians (physicians and psychiatric nurse practitioners). **RESULTS:** Following project implementation, monitoring adherence of parameters including measures of fasting blood glucose, fasting lipid profile and waist circumference significantly improved for patients prescribed SGA medication at time of admission. For patients beginning a new SGA trial, monitoring of waist circumference statistically significantly improved. Clinically significant improvement was seen for fasting blood glucose, fasting lipid profile, and waist circumference. For all patients discharged on an SGA, recommendations for follow-up metabolic monitoring significantly improved. **CONCLUSIONS:** Implementing an organizational metabolic monitoring policy improved both in-patient monitoring adherence and discharge recommendations for pediatric patients prescribed SGA medication. **KEYWORDS:** metabolic monitoring, clinician adherence, pediatric patients, SGA.

Introduction

The prevalence of psychotropic medication prescription use in youth has increased over the past several years (Olfson, et. al, 2015; Patten, et. al, 2012; Pathak, et. al, 2010). Using National Health and Nutrition Examination Survey (NHANES) data, the Centers for Disease Control and Prevention (CDC) found that between 2005 and 2010, approximately 6% of adolescents within the United States (U.S.) reported using psychotropic medication within the past month with 1% reporting use of antipsychotic medication (CDC, 2013). Utilization of antipsychotic medication for youth has also increased for other countries and is not exclusive to the U.S. Research shows that between 2005 and 2009, recommendations for second-generation antipsychotics (SGAs) by Canadian physicians increased by 114% (Pringsheim, et al., 2011).

Metabolic monitoring is an important aspect in SGA treatment for the pediatric patient population given the risk of significant metabolic side effects associated with SGA's (Panagiotopoulous, 2012; Delate, 2014; Sjo, 2017). These metabolic side effects are associated with metabolic dysregulation and increased cardiometabolic risk (Ronsley, et al., 2015; Correll, et al., 2009) and further demonstrate the necessity of metabolic monitoring and follow-up recommendations of youth prescribed SGA medications. Prevalence of SGA utilization, metabolic risks, and continued lag in consistent and adequate metabolic monitoring, helps establish the need for efforts to improve monitoring adherence of prescribing clinicians.

A review of the existing literature yielded several studies that found metabolic monitoring of pediatric patients prescribed SGA medication using best practice guidelines was low, overall. Nolt, et. al (2017) concluded that only 13.2% of patients treated with SGA medication received monitoring for all metabolic parameters. Another study reported a compliance rate of just 20% for metabolic monitoring parameters based on the ADA-APA recommended guidelines (Javaheri, et. al., 2019). Finally, Ghate, et. al (2012) concluded that the

majority of adolescent patients were under-monitored for BMI, fasting glucose and lipid panels, with monitoring of all parameters being just 1%.

Poor compliance was also noted in studies focusing on monitoring adherence specific to baseline metabolic parameter measures of children and adolescents initiated on a new SGA medication trial. Kauffman, et. al (2017) reported that less than 1% of patients newly initiated on a SGA trial received baseline monitoring and Raebel, et. al. (2014) found that only 11% of patients with new SGA trial received baseline fasting glucose or hemoglobin A1c testing. An additional study, (Wakefield, et. al., 2019) focused on the metabolic monitoring rates of primary care providers compared to psychiatry. Higher rates of BMI monitoring by primary care compared to psychiatry was found, whereas no significance was found for other parameters and it was concluded that metabolic monitoring of pediatric patients beginning new SGA trials was low, overall.

Other studies focused on clinician self-reports of metabolic monitoring compared to monitoring behaviors of youth prescribed SGA medication. Rodday, et. al (2015) reported that while two-thirds of providers self-reported metabolic parameter monitoring, findings showed inconsistent monitoring patterns and that measurement of waist circumference by provider self-report was just 23%. Minjon, et. al., 2018 similarly found that providers self-reported compliance with metabolic monitoring but results indicated great variability, with 53% and 58% self-reporting baseline monitoring of fasting lipids and glucose and only one provider self-reporting monitoring of all parameters.

Given the prevalence and associated risks of SGA use, the American Diabetes Association-American Psychiatric Association (ADA-APA) established best practice guidelines for metabolic monitoring of children and adolescents treated with SGAs. ADA-APA recommended parameters include: baseline history, height, weight, body mass index (BMI), blood pressure (BP), waist circumference, fasting plasma glucose, and fasting lipid profile at

baseline and follow-up monitoring time points of 1, 2, 3, 4 and 12 months and every 5 years (ADA-APA, 2004).

Despite formal monitoring guidelines by ADA-APA, recent studies show continued subpar, fragmented and inadequate metabolic monitoring rates, with few pediatric patients treated with SGAs receiving baseline and follow up metabolic monitoring (Coughlin, et al., 2018; Ghate, 2012; Javaheri, et al., 2012; Kauffman, et al., 2017; Raebel, et al., 2019; Wakefield, 2019). These study findings are consistent with the clinical approach at the selected practice setting, with the current standard of care being determined by individual clinician judgment. Thus, the purpose of this project was to implement an intervention, following ADA-APA guidelines, to improve both in-patient metabolic monitoring adherence and discharge recommendations for follow-up monitoring for pediatric patients prescribed SGA medication. The Plan-Do-Study-Act (PDSA) served as the framework for implementing procedural guidance based on ADA-APA's recommendations and was selected to allow for continuous evaluation and assessment associated with the rapid-cycle aspect of PDSA model.

Methods

The selected practice setting was a small, 48-bed acute, in-patient psychiatric hospital for pediatric patients located in the Southeastern region of the United States and situated in a rural mountainous city. The project team included the project leader and four prescribing clinicians. Project participants included prescribing clinicians (six physicians and three psychiatric nurse practitioners). An organizational assessment was conducted to assess aspects of the clinical setting requiring consideration for developing and implementing the project plan. Project implementation included chart reviews, an education session, metabolic monitoring protocol development, per ADA-APA guidelines, and was followed by implementation and evaluation of the project.

A one-hour education session was provided to participants to review ADA-APA guidelines and orientation of the new monitoring protocol, outlining specific steps for metabolic monitoring of patients prescribed SGA on admission or beginning SGA trial during hospitalization. Data collection time points (pre and post project implementation) via chart reviews occurred over a 30-day period for the same calendar month but subsequent calendar years. The clinical setting lacked an electronic health record (EHR) system. Therefore, data collection for the designated time points consisted of reviewing individual pen and paper charts. SPSS, V. 26 was utilized for statistical analysis and comparison of clinician's monitoring adherence.

This project involved no human research and was determined to be a QI initiative by the Institutional Review Board (IRB). Identifying demographic information was not collected as to protect patient confidentiality. Charts reviewed received a numeric assignment by order of admission. A chart audit data form was used for data collection and was stored on a hard drive at a designated computer at the practice setting.

Results

A total of 87 charts were reviewed for all patients admitted between two designated time periods (N = 87). Thirty-seven patients were admitted during the pre-implementation period (42.53%) compared to 50 (50.47%) patients admitted during post implementation.

Independent Samples Mann-Whitney U Test was conducted to compare age differences to account for the lack of normal distribution for the continuous variable, age in years. The median age in years for the pre-implementation group was 14.00 (IQR = 12.50-16.00) compared to the median age in years of 15.50 (IQR = 13.00-17.00) for the post-implementation groups, and indicated no statistically significant difference (MWU = 745.00, Z=-1.57, p = .117). A Chi-square test was conducted for comparison of SGA Use On Admission; the percentage of patients prescribed SGA on Admission was 51.4% (N = 19) for the pre-implementation group compared

to 58% (N = 29) for the post-implementation group and was not statistically significant (χ^2 = 0.380, df = 1, p = .538). The Fisher's Exact Test was used to compare New SGA Trial; the percentage of patients started on New SGA Trial was 18.9% (N = 7) for the pre-implementation group compared to 8% (N = 4) for the post-implementation group and was not statistically significant (χ^2 = 2.295, df = 1, p = .192).

SGA On Admission

A Chi-square test was conducted to compare the adherence to metabolic monitoring parameter measures between the pre-implementation and post-implementation groups for the 48 patients who were prescribed SGA on admission (see Table 1). Parameters, patient history, height and weight were measured for 100% of all patients in both the pre-implementation and post-implementation groups. Blood pressure was measured for 89.5% (N = 17) of the pre-implementation group compared to 96.6% (N = 28) of the post-implementation group. The result was not statistically significant (χ^2 = .981, df = 1, p = .554). BMI was measured for 31.6% (N = 6) of the pre-implementation group compared to 51.7% (N = 15) for the post-implementation group. The result was not statistically significant (χ^2 = 1.893, df = 1, p = .169). Fasting glucose was measured for 0 (0%) of the pre-implementation group compared to 72.4% (N = 21) of the post-implementation group. The result was statistically significant (χ^2 = 24.460, df = 1, p = < .001, Phi = .714). Fasting lipid panel was measured for 0 (0%) of the pre-implementation group compared to 72.4% (N = 21) of the post-implementation group. The result was statistically significant (χ^2 = 24.460, df = 1, p = < .001, Phi = .714). Waist circumference was measured for 0 (0%) of the pre-implementation group compared to 62.1% (N = 18) for the post-implementation group. The result was statistically significant (χ^2 = 18.869, df = 1, p = < .001, Phi = .627).

New SGA Trial

A Chi-square test was conducted to compare the 11 out of 87 new SGA trial metabolic monitoring parameter adherence measures between the pre-implementation and post-implementation groups. Of these 11, 7 were pre-implementation and 4 were post-implementation (see Table 1). Fasting glucose was measured for 28.6% (N = 2) of the pre-implementation group compared to 100% (N = 4) of the post-implementation group. The result was not statistically significant ($\chi^2 = 5.238$, df = 1, p = .061). Fasting lipid panel was measured for 42.9% (N = 3) of the pre-implementation group compared to 100% (N = 4) of the post-implementation group. The result was not statistically significant ($\chi^2 = 3.592$, df = 1, p = .194). Waist circumference was measured for 0 (0%) of the pre-implementation group compared to 100% (N = 4) for the post-implementation group and was statistically significant ($\chi^2 = 11.00$, df = 1, p = .003).

Discharge Recommendations

Chi-square testing was conducted to compare the discharge recommendations for follow-up metabolic monitoring between pre-implementation and post-implementation groups for both SGA on admission and new SGA trial (see Table 2). A total of 56 patients (64.4%) received SGA on admission or new SGA trial. Discharge recommendations for follow up metabolic monitoring was 13% (N = 3) for the pre-implementation group compared to 69.7% (N = 23) of the post-implementation group and was statistically significant ($\chi 2 = 17.490$, df = 1, p < .001, Phi = .559).

Discussion

Implementing a metabolic monitoring policy, based on ADA-APA guidelines, demonstrated significant improvement in clinician monitoring adherence and follow-up discharge recommendations for pediatric patients prescribed SGA medication.

For patients with a current SGA prescription on admission, metabolic monitoring improved for five of the eight parameters measured. Improved parameters included fasting blood glucose, fasting lipid panel, waist circumference, blood pressure and BMI. Monitoring of fasting blood glucose and fasting lipid panel both significantly improved (0% to over 72%) with both demonstrating strong effect size (Phi = .714). Waist circumference monitoring also significantly improved (0% to over 62%) with strong effect size (Phi = .627). Monitoring of blood pressure improved (90% to over 96%), as did BMI monitoring (32% to over 52%) however, neither was found to be statistically significant. Parameters history, height, and weight were all noted to be 100% for both time points, which was expected given measurements of these parameters are long-standing and collected for all patients upon hospital admission.

Metabolic parameters measured for patients prescribed new SGA trial during hospitalization included fasting blood glucose, fasting lipid panel and waist circumference. Monitoring adherence for all three parameters improved. Waist circumference improved significantly (0% to 100%). Fasting glucose monitoring improved (29% to 100%) and fasting lipid panel improved (43% to 100%). Although fasting blood glucose and fasting lipid panel did not result significant improvement, results are noted to be clinically relevant.

Discharge recommendations for follow-up metabolic monitoring for patients prescribed SGAs significantly improved (13% to over 69%) with moderate to strong effect size (Phi = .559). The metabolic monitoring protocol developed for the clinical setting provided clinicians with specific parameters and procedural steps to follow during hospitalization but did not include guidance specific to follow-up recommendations for metabolic monitoring at time of discharge. Therefore, results related to change in discharge recommendations pre-implementation compared to post implementation are considered to be clinician's independent clinical decision. This finding is of notable importance and suggests a more comprehensive clinician approach to metabolic monitoring of pediatric patients prescribed SGA medication following implementation

of the monitoring protocol. It further suggests that implementing a facility specific metabolic monitoring protocol, coupled with education regarding metabolic monitoring, can have positive impacts on continuity of care and affect quality of care beyond the facility itself.

Strengths associated with this project included small clinical setting and high level of buy in from both executive and clinical leadership. Limitations included time constrictions for implementation of the project and the clinical setting's pending transition from pen-and paper charting to electronic health record during the implementation phase of the project. Also, occurred during pandemic. One doctoral student investigator leading project.

Project results will be reviewed by the clinical executive team within the practice setting to determine approval for operationalization of the metabolic monitoring protocol. The approval process will be followed by policy development to formalize standard of care and clinical expectations for metabolic monitoring of pediatric patients prescribed SGA medication.

Conclusion

This project demonstrates how specific focus on implementing a structured protocol that initiates metabolic monitoring at time of admission improves in-patient standard of care while strengthening continuity of care at time of discharge. In doing so, children and adolescents prescribed SGA medications will receive enhanced quality of care related to metabolic monitoring that is in keeping with best practice guidelines, regardless of the clinical setting.

This project highlights the potential for optimizing positive impacts related to QI initiatives to enhance quality of care and outcomes associated with monitoring SGA use for pediatric patients and helps to optimize continuity across clinical settings. Future considerations should include exploration of collaborative approaches with outpatient providers, incorporation of patient education, inclusion of social work discipline to augment in-patient and outpatient communication, as well as closer examination of the processes required for transitioning from

pen and paper orders to automated set orders for metabolic monitoring of pediatric patients prescribed SGA medication.

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Table 1.

Second-Generation Antipsychotic Use on Admission and New Trial: Pre-Implementation and Post-Implementation Parameter Measures

Parameter	Pre N=19	Post N=29	Sig.
SGA Use on Admission N = 48 (%)			
Personal / Family History	19 (100.0)	29 (100.0)	-
Blood Pressure	17 (89.5)	28 (96.6)	.554[2]
Height	19 (100.0)	29 (100.0)	-
Weight	19 (100.0)	29 (100.0)	-
Body Mass Index	6 (31.6)	15 (51.7)	.169[3]
Fasting Glucose	0 (0.00)	21 (72.4)	< .001[3]
Fasting Lipid Panel	0 (0.00)	21 (72.4)	< .001[3]
Waist Circumference	0 (0.00)	18 (62.1)	< .001[3]
	Pre N=7	Post N=4	Sig.
New SGA Trial N = 11 (%)			
Fasting Glucose	2 (28.6)	4 (100.0)	.061[1]
Fasting Lipid Panel	3 (42.9)	4 (100.0)	.194[1]
Waist Circumference	0 (0.0)	4 (100.0)	< .003[1]

1=Independent Samples Mann-Whitney U Test
2=Chi-Square Test
3=Fisher's Exact Test

Table 2

Discharge Recommendations for Follow-up Metabolic Monitoring: All Second Generation Antipsychotic Use (N = 56)

	Pre N=23	Post N=33	Sig.
Discharge Recommendations N (%)	3 (13.0)	23 (69.7)	< .001[1]

1=Fisher's Exact Test