Implementation of a Clinical Decision Support System to Increase Metabolic Screening of patients taking second-generation antipsychotics at a Federally Qualified Health Center

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Abstract

Metabolic Syndrome (MetS) is a well-documented adverse effect of second-generation antipsychotics (SGAs). Patients taking SGAs are at an increased risk for developing cardiovascular events and complications. As a result, the American Diabetes Association (ADA) and the American Psychiatric Association (APA) published a consensus guideline for antipsychotic-induced cardiometabolic screening. However, there is evidence that suggests screening for MetS is suboptimal in patients taking SGAs. To address the gap that exists between guideline-based care and clinical practice, this quality improvement (QI) project seeks to implement a metabolic screening protocol (MSP) by way of a clinical decision support system (CDSS) in a federally qualitied health center (FQHC) to increase metabolic screening.

Keywords: metabolic syndrome, clinical decision support system, electronic health record, health information technology, metabolic screening, best practice advisory, best practice alerts

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Second-generation Antipsychotics and Metabolic Syndrome

Antipsychotic medications are an important component in the management of many psychotic conditions. Antipsychotic medications are commonly divided into two classes, first-generation antipsychotics (FGAs) and second-generation antipsychotics (SGAs). Although FGAs cause significant extrapyramidal symptoms, while only alleviating the positive symptoms seen in psychotic conditions; they continue to be widely available for use. The effort to find medications that are more effective and with less-severe side effects, lead to the development of SGAs, often referred to as atypical antipsychotics (American Diabetes Association [ADA} & American Psychiatric Association [APA], 2004). Despite their well-known benefits in managing psychiatric symptoms, systematic reviews and meta-analyses of randomized control trials have shown that SGAs are associated with increased risk of cardiometabolic effects such as weight gain, high blood pressure, alternations in glucose metabolism, and lipid dysregulation; which are all well-known risk factors for cardiovascular diseases (CVDs) and diabetes (Azfr Ali et al., 2021; Hirsh et al., 2017)). Given this association, SGAs have become first-line agents for their indicated use and are also used off label for treatment of conditions such as insomnia which is a common complaint in primary care (Abosi et al., 2018).

Metabolic Syndrome (MetS), also known as syndrome X or insulin-resistance syndrome is a cluster of conditions that occur together as a common feature. Components of metabolic syndrome include hypertension, abdominal obesity (also known as central obesity), dyslipidemia, and impaired glucose tolerance (Abosi et al., 2017). MetS is associated with an increased risk of cardiovascular disease (CVD) and all-cause mortality (Hirode & Wong, 2020).

Standardized screening for MetS affords providers the opportunity to identify high-risk groups, such as those with severe mental illness taking SGAs. However, Azfr Ali et al. (2021) has found screening and monitoring practices for patients taking SGAs to be suboptimal at best. Suboptimal cardiometabolic screening can hinder early detection of MetS among high-risk groups, and delay intervention if needed. This quality improvement (QI) projects seeks to utilize tools of health information technology to implement a metabolic screening protocol (MSP) at a FQHC to increase metabolic screening, thus improving outcomes of patients taking SGAs.

Setting

The site for this proposed QI project is Delaware Valley Community Health (DVCH), which is a non-profit healthcare organization that operates nine FQHCs in Southeastern Pennsylvania. DVCH provides an array of health services including primary care for adults and families, women's health services, medication-assisted treatment for opioid-use disorder, behavioral health, care coordination, and health education. Two of their FQHCs in Philadelphia will be at the center of this QI project: Fairmount Primary Care Center at Girard Medical Center and Maria De Los Santos Health Center. Both health centers serve primarily African American and Latino patients who are underserved. As it currently stands, DVCH does not have a standardized MSP in place to ensure clinical staff and providers follow guideline-based screening recommendations for patients taking SGAs. This has been confirmed with the Chief Quality and Innovation Officer at DVCH, Kimberly Allen, who reflected on the healthcare needs of this patient population at these two heath centers. To narrow the gap that has been identified between guideline-recommended practice and current clinical practice at DVCH, this QI project will involve the implementation of a standardized MSP (see appendix A) via an electronic health record (EHR)-based clinical decision support system (CDSS) to improve patient outcomes and

quality measures.

Practice Guidelines for Metabolic Screening

In 2004, the American Diabetes Association (ADA), American Psychiatric Association (APA), American Association of Clinical Endocrinologist (AACE), and North American Association for the Study of Obesity (NAASO) published a consensus guideline for antipsychotic-drug induced cardiometabolic monitoring; specifically for monitoring the metabolic consequences of SGAs (ADA & APA, 2004). The ADA/APA consensus gives prescribing providers recommendations for screening measures to be obtained prior to initiation of SGAs and for follow-up monitoring once the medication is prescribed. The screening measures include personal and family history of risk factors (diabetes, hypertension, dyslipidemia, or CVD), body mass index (BMI), waist circumference, blood pressure, fasting plasma glucose (FPG), and fasting lipid panel (FLP). Furthermore, the guideline provides a recommended timeline for when screening should occur (ADA & APA, 2004). The standardized MSP that will be implemented in the EHR at DVCH was developed by the project leader using the ADA/APA 2004 guidelines.

Health Information Technology Tools

The Office of the National Coordinator for Health Information Technology (ONC) defines clinical decision support (CDS) as a health information technology component that:

> provides clinicians, staff, patients, or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and healthcare. CDSS encompasses a variety of tools to enhance decision-making in the clinical workflow. These tools include computerized alerts and reminders to care providers and patients; clinical guidelines; condition-specific order sets; focused data

> reports and summaries; documentation templates; diagnostic support and contextually relevant reference information, among other tools. (ONC, 2018, para.1)

Additionally, CDS tools are incorporated into EHRs to encourage clinicians to make the best decisions within the clinical workflow at the point-of-care. Best practice alerts (BPAs) are the most familiar CDSS tool that can be incorporated into the EHR (McBride & Tietze, 2019). Per Cohen et al. (2020), BPAs can be active or passive. An active alert is an interruptive pop-up that would alert the provider to the MSP when an SGA is being initiated or when the medication is being renewed. The passive alert does not interrupt the clinical workflow, however; it is fired when the EHR captures an SGA on a patients' active medication list when the chart is opened (Cohen at al., 2020). For this QI project, the project leader is proposing to alert clinical staff and providers at DVCH of the MSP through active and passive BPAs in their clinical workflow.

Methods

Prior to implementation, clinical staff and providers at DVCH will receive an educational session on SGAs, their effect on MetS, as well as guideline-based recommendations for metabolic screening per ADA/APA published guidelines. The educational session will be presented in Power Point presentation by the project leader. At the end of the educational session, participants will be encouraged to take a post-education survey that will test their knowledge of guideline-based recommendations (see appendix B). The post-education survey will also ask participants about their perceived barriers to metabolic screening. The post-education survey will be sent out to participants electronically via SurveyMonkey. Aggregate data will be collected on compliance of metabolic screening prior to CDSS implementation and after CDSS implementation, by conducting a prospective chart review via a query system in their EHR. The data collected will be analyzed using an Excel worksheet.

Quality Measures and Expected Outcome

According to the National Committee for Quality Assurance (NCQA), "because persons with serious mental illness who use antipsychotics are at an increased risk of cardiovascular diseases and diabetes, screening and monitoring of these conditions is important" (NCQA, 2022, para.4). Diabetes and cardiovascular screening and monitoring for people with Schizophrenia and Bipolar Disorder who are prescribed antipsychotic medications is a Healthcare Effectiveness Data and Information Set (HEDIS) quality measure that assesses adults 18-64 years of age who have screening tests done in any given year (NCQA, 2022). This proposed QI project can help improve CVD and diabetes screening quality measures at DVCH. Implementing an EHR-based MSP is expected to increase the number of patients taking SGAs who are screened, as well as increase clinical staff and provider compliance to guideline-recommended care.

Summary of Literature Review

Several databases were used to review literature related to CDSS, BPAs and metabolic screening in patients taking SGAs. The databases that were used for this search included the Cumulative Index of Nursing and Allied Health Literature (CINAHL), Cochran Library, and PubMed. Search terms included: "best practice alerts", "clinical decision support", "Metabolic syndrome", "best practice advisory", "second-generation antipsychotics", and "clinical decision support system".

In their study to identify the impact of electronic order sets and reminders for monitoring parameters for antipsychotic medications, Poker et al. (2010) demonstrated the impact of a computerized alert system on baseline monitoring which revealed a statistically significant increase in orders for baseline labs – HbA1c and lipid panel – with 32% to 54% of providers ordering monitoring parameters prior to implementation and 78% to 100% of providers ordering

these same parameters post-implementation ($p < .001$). The results from this study showed that order sets and reminders in the form of alerts embedded into the EHR can improve monitoring parameters and ordering of labs required for metabolic screening.

Similarly, Cohen et al. (2020) looked at the effect of a computerized BPA system on metabolic monitoring in patients taking SGAs. The primary outcome they were interested was a composite of metabolic lab order rates, which included FBG, HBA1c and/or FLP, in patients prescribed SGAs. They found that patients diagnosed with a thought disorder were significantly more likely to have monitoring labs ordered compared to patients without a diagnosed thought disorder (CI 1.12-2.22, $p = .011$). Additionally, significantly more monitoring labs were ordered in the enter order section than in the general BPA section of the EHR (adjusted CI 4.46-6.69, adjusted $p < .001$) (Cohen et al., 2020). Although opportunities for improvement was identified, the active BPA system was found to positively impact metabolic monitoring for patients taking SGAs.

Castaneda et al. (2015) states that CDSS provides a standardized and methodological way to implement clinical guidelines into EHRs with the ability to integrate data and information into clinically relevant knowledge. By doing so, that can ensure provider adherence to clinical guidelines which contribute to meeting quality measures. In their reviews of CDSS, Sutton et al. (2020) and Flander at al. (2015) found that they can increase provider adherence to clinical guidelines and improve the quality of clinical documentation. Gibbs at al. (2020) conducted a QI project in an urban acute care hospital that looked at the use of CDSS to facilitate nurses' adherence to treatment protocols for hypoglycemia. Chart reviews were conducted via the EHR prior to implementation and after implementation of a BPA and intervention flowsheet, and they found that adherence to the treatment protocol improved from 55% to 69% and BPA and

flowsheet documentation improved documentation adherence from 72% to 87% post-implementation (Gibbs et al., 2020). Although the role and effectiveness of CDSS have not been fully reviewed due to their increasing complexity through advances in artificial intelligence, interoperability, and new sources of data; review of the evidence described above displays the potential benefits of CDSS in meeting quality measures this QI project seeks to improve.

Resources for Implementation

The successful implementation of an EHR-based BPA for metabolic screening requires financial, technological, and human resources. Integrating a BPA into the EHR at DVCH requires members of a team who understand the clinical relevance of the care being addressed by the BPA, and the relevant workflows and processes (Osheroff et al., 2012). Members of this team includes physicians, nurse practitioners, nurses, medical assistants, executive team stakeholders, and EHR programmers. Clinical champions are also vital members of the team as they assist with gaining support and buy-in from end users of the new system. Technological resources include reliable broadband internet access, EHR software that support CDSS capabilities, and competent information technology (IT) personal to assist with technological challenges that may arise when implementing new technologies into healthcare.

Financial Resources and Funding Source

According to Sutton et al. (2020), up to 74% of clinics, health centers, and hospitals with CDSS integrated into their EHRs report that financial viability remains a struggle. Outset costs for initial set-up and integration, as well as on-going costs for training and system updates will be needed for success and sustainability. The Health Information Technology for Economic and Clinical Health (HITECH) Act authorized tens of billions of dollars in federal subsidies to hospitals and eligible physicians to adopt certified HER systems (Lite et al., 2020). Integrating

CDSS into EHRs is a key strategy within the HITECH Act and is used for attaining meaningful (MU) use of EHRs. Therefore, implementing a CDSS such as BPA in the EHR at DVCH qualifies as MU which can help increase their eligibility for subsidy payments. Improving quality measures such as increasing metabolic screening for patients taking SGAs can also help DVCH maximize reimbursement for services from Centers for Medicare and Medicaid Services (CMS).

Impact

Implementing EHR-based BPA for metabolic screening would have positive clinical, financial, and organizational outcomes for DVCH. The clinical impact involves improving the health outcomes for patients taking SGAs. By increasing metabolic screening, cardiometabolic disturbances are recognized early, thus leading to timely intervention and better health outcomes. Clinical staff and providers who prescribe SGAs are more likely to adhere to clinical guidelines, thus impacting organizational and financial goals of improving quality measures that qualify for reimbursement. Given that this proposed QI project is to be implemented at two DVCH centers, if successful, the goal is to have this project expanded to their other health center locations.

SWOT Analysis

A SWOT analysis is a business model used to identify strengths, weaknesses, opportunities, and threats of an organization (Schooley, 2022). This business model is also useful in healthcare to help healthcare organizations develop awareness of all factors involved in making business decisions. When deciding to implement an EHR-based DCSS for metabolic monitoring, there are a few things to consider. In their review of CDSS, Sutton et al. (2020) found that patient safety is improved through reminder systems such as BPAs. Their capability to generate relevant and patient-specific recommendations at the point-of-care and improve the quality of clinical documentation speaks to their impact on patient safety (McBride & Tietze,

2019). Another strength of CDSS is that they have been shown to increase provider adherence to clinical guidelines which is a strength for any healthcare organization (Sutton et al., 2020). CDSS in the form of BPAs can also be cost-effective for health systems by reducing test and order duplication and automating tedious steps within the clinical workflow.

A major weakness in the implementation of this QI project is potential pushback from end-users due to concerns about workflow disruption and perceived lack of autonomy when making clinical decisions. Conversely, another potential weakness is end-user reliance or excessive trust in the accuracy of a system with capability for design failures. Financial challenges may also present as a weakness for implementation due to lack of capital and/or human resources, as well as the lack of cost-effectiveness in the long-term. Alert fatigue also presents as a major weakness for this QI project as passive BPA alerts may be dismissed and viewed as insignificant.

Advancement towards a more comprehensive EHR to meet MU of EHRs standards is a major opportunity. Other opportunities include improved exchange of patient information, collaboration between healthcare providers and health care systems who use the same EHR, and standardization of care for patients taking SGAs at DVCH. Threats to the implementation of this QI project include lack of transportability and interoperability. Programming complexities, incorrect or complicated algorithms, and diverse sources of clinical data contribute to these threats (Sutton et al., 2020).

As technology continues to advance, it is important that healthcare organizations use evidence-based technological tools available to improve population health, while providing effective and efficient healthcare services. The implementation of an EHR-based CDSS proposed in this paper has the potential accomplish that.

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Appendix A

Standardized Metabolic Screening Protocol

Patient prescribed a second-generation antipsychotic (SGA) noted below:

__Aripiprazole (Abilify)

__Asenapine (Saphris)

__Clozapine (Clozaril)

__Iloperidone (Fanapt)

__Lurasidone (Latuda)

__Olanzapine (Zyprexa)

__Paliperidone (Invega)

__Quetiapine (Seroquel)

__Risperadone (Risperdal)

__Ziprasidone (Geodon)

Screening protocol prior to initiating SGA, per ADA/APD guidelines:

__Personal and Family History of Diabetes HTN, Dyslipidemia, and CVD

__BMI

__Waist Circumference

__Fasting plasma glucose

__Hemoglobin A1c

__Blood Pressure

__Fasting Lipid Profile

Screening protocol for ongoing monitoring, per ADA/APA guidelines:

	Baseline	Week 4	Week 8	Week 12	Quarterly	Annually
Personal/Family History	X					X
BMI (Weight/Height)	X	X	X	X	X	X
Waist Circumference	X					X

Blood Pressure	X			X		X
Fasting Plasma Glucose/Hgb A1c	X			X		X
Fasting Lipid Profile	X			X		X*

ADA/APA, 2004

*If significant abnormalities are present, lipid panel should be monitored annually. If no abnormalities exist, fasting lipid profile should be monitored every 5 years.

Appendix B

Post-Educational Survey

1. Prior to this information session, were you aware of the 2004 ADA/APA guidelines for screening and monitoring of patients taking second-generation antipsychotics (SGAs)?

   __Yes

   __No

2. Was the information presented in this informational session contribute to your overall understanding of SGAs and metabolic syndrome (MetS)?

   __Yes

   __No

3. Are any aspects of the ADA/APA screening guidelines (weight, BP, lipid profile, weight, height) incorporated into current clinical practice at your site?

   __Yes

   __No

4. Do you believe the implementation of a metabolic screening protocol (MSP) would increase the rate of screening for MetS in patients taking SGA at your site?

   __Yes

   __No

5. Do you anticipate any barriers to screening for MetS in patients taking SGAs at your site? If yes, please provide a brief explanation.

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