**Implementing a QTc Prolongation Risk Assessment Template for ECG Monitoring in Patients on Psychotropic Medication: A Quality Improvement Project**

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By

Alexis S. Williams, MSN, PMHNP-BC

Supervised By

Dr. Antonella Grana, DNP, APRN, PMHNP-BC

Clinical Preceptor: Dr. Craig Jordan Jr., DNP, PMHNP-BC

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Michael Sanchez, DNP, APRN, FNP-BC, FAANP
DNP Program Director

## Abstract

QTc prolongation is a significant clinical concern among psychiatric patients prescribed psychotropic medications, as it increases the risk for life-threatening arrhythmias such as torsades de pointes and sudden cardiac death. Despite these risks, standardized protocols for electrocardiogram (ECG) monitoring in the outpatient psychiatric setting remains inconsistent. This Doctor of Nursing Practice (DNP) quality improvement project aims to implement a validated, evidence-based QTc Prolongation Risk Assessment Template—specifically, the Tisdale QT Risk Assessment Tool—at Recovery From Society (RFS) Psychiatry in Tampa, Florida, to enhance systematic ECG monitoring and informed clinical decision-making. Guided by the Health Belief Model, the intervention consisted of structured provider education, integration of the tool into the electronic health record (TherapyNotes), and follow-up surveys that assessed provider confidence, intent to implement, and the tools usability. The post-intervention survey responses revealed high satisfaction with the training, increased provider confidence, and strong intent to incorporate the tool into practice. A large effect size (Cohen's d = 1.03) further supported the clinical significance of the intervention. RFS Psychiatry staff identified barriers, such as time constraints and patient adherence, feedback that can be used for future quality improvement initiatives for QTc monitoring. Despite the projects limitations, including a small sample size and the absence of a control group, this project demonstrates the value of integrating standardized QTc risk assessment protocols into outpatient psychiatric care. Sustainability efforts include continued training, workflow integration, and administrative oversight. This project highlights the leadership role of advanced practice nurses in promoting safe prescribing practices, standardizing care, and enhancing patient outcomes through evidence-based practice.

*Keywords: QT prolongation, QTc prolongation, torsades de pointes, ECG monitoring, psychotropic medications, psychiatric care, standardized protocol, evidence-based practice, patient safety, quality improvement project, Health Belief Model*

## Table of Contents

## LIST OF TABLES



## Introduction

QTc prolongation is a significant medical concern, particularly in patients with comorbid medical and psychiatric conditions, as it is associated with an increased risk of life-threatening arrhythmias such as torsades de pointes. This issue becomes especially pertinent in populations frequently prescribed psychotropic medications, which are known to contribute to QTc interval prolongation. Despite the recognized dangers associated with QTc prolongation, there is currently no standardized protocol for the systematic monitoring of the QTc interval in psychiatric patients. Consequently, provider practices vary widely, with clinical decisions primarily based on individual judgment rather than standardized, evidence-based guidelines (Harb et al., 2024). This inconsistency in practice poses a significant risk to patient safety, as some individuals may not receive the necessary electrocardiogram (ECG) monitoring that could prevent fatal cardiac events.

Psychiatric patients are particularly vulnerable to the risks associated with QTc prolongation due to their elevated rates of chronic medical conditions and polypharmacy. Many patients are prescribed a multitude of medications, including psychotropics, which can lengthen the QTc interval. Research has shown that patients with a QTc interval of 500 milliseconds (ms) or greater have a significantly higher mortality risk (Xiong et al., 2020). Despite this, many clinicians opt not to perform routine ECG monitoring, citing barriers such as a lack of resources, time constraints, or a perceived low risk of cardiac arrhythmias in their patient population. This practice gap underscores the need for a more structured approach to managing QTc prolongation in psychiatric patients.

This Doctor of Nursing Practice (DNP) project aims to implement a QTc prolongation risk assessment template—the Tisdale QT Risk Assessment Tool— to facilitate and standardize ECG monitoring in patients prescribed psychotropic medications. This tool is designed to

improve the ease of monitoring, enhance documentation, and increase adherence to clinical guidelines for prescribing providers. By establishing a consistent and evidence-based approach to monitoring QTc intervals, this project aims to reduce the risk of adverse cardiac events, including torsades de pointes and sudden cardiac death, associated with QTc prolongation. Implementing this tool will improve clinical practice and enhance patient outcomes, particularly in populations at higher risk, such as patients with complex medical and psychiatric conditions.

The relationship between QTc prolongation and ventricular tachyarrhythmias, such as torsades de pointes (TdP), is well established. These arrhythmias can lead to life-threatening events, such as ventricular fibrillation and sudden cardiac death (Xiong et al., 2020). Despite these risks, many psychiatric care settings lack a standardized approach to ECG monitoring. Although several guidelines and recommendations support ECG monitoring for patients on psychotropic medications, no single evidence-based clinical practice guideline has been universally adopted. As a result, ECG monitoring in many cases is based solely on provider judgment, which can lead to inconsistent practices and, in some cases, inadequate monitoring of at-risk patients.

Given the complexity of the psychiatric population and the elevated risks associated with QTc prolongation, there is a pressing need for standardized ECG monitoring protocols. By implementing a QTc prolongation risk assessment template, clinicians can ensure that patients on psychotropic medications receive the appropriate level of monitoring, potentially preventing fatal cardiac events. Through careful analysis of existing studies and guidelines, this DNP project aims to establish the utility and effectiveness of a standardized approach to QTc monitoring, ultimately improving the safety and quality of care for this vulnerable population.

In conclusion, while current practices regarding ECG monitoring for QTc prolongation vary, this DNP project aims to address the care gap by introducing an evidence-based, standardized risk assessment tool. The goal is to promote better adherence to monitoring guidelines, improve clinical decision-making, and reduce the incidence of adverse outcomes, particularly in populations like psychiatric patients who face higher risks due to the complexity of their medical and psychiatric conditions.

## Problem Statement

QTc prolongation refers to an extended duration of the corrected QT interval on an electrocardiogram (ECG), a key marker of electrical activity in the heart. When not managed effectively, this condition can lead to life-threatening arrhythmias such as Torsades de Pointes (Malone & Hancox, 2020). A normal QTc interval is less than 420 msec in men and less than 440 msec in women, with prolongation being defined as greater than 470 msec in males and greater than 480 msec in females (Tisdale et al., 2013).

Healthcare professionals, including physicians, nurses, and pharmacists, play a crucial role in managing QTc prolongation. This condition can be caused by psychotropic medications and other factors such as bradycardia, electrolyte imbalances, older age, and structural heart disease (Funk et al., 2020; Xiong et al., 2020). Given the complex etiology, assessing and monitoring patients for QTc prolongation is crucial, particularly when multiple risk factors coexist. Tools such as the CredibleMeds website categorize the risk of QTc prolongation and Torsades de Pointes when prescribing certain medications, assisting health professionals who play a central role in medication safety, but this resource solely focuses on the medication prescribed not the condition of the patient ingesting it (Woosley et al., 2013).

As stated, QTc prolongation, a condition associated with life-threatening arrhythmias such as torsades de pointes, poses a significant public health concern, particularly in patients with comorbid medical and psychiatric conditions. Psychiatric patients are often prescribed a multitude of medications, including psychotropics, which can increase the risk of QTc prolongation. These patients are particularly vulnerable due to their higher rates of chronic medical conditions and polypharmacy, which exacerbates their risk. Despite this, no standardized protocol currently exists for systematic ECG monitoring in this population, leading to variability in provider practice. Many clinicians rely solely on their clinical judgment when deciding whether to monitor the QTc interval, often forgoing ECG monitoring due to time constraints, resource limitations, or perceived low risk (Harb et al., 2024; Xiong et al., 2020). This lack of standardization increases the likelihood that preventable adverse outcomes, such as arrhythmias or sudden cardiac death, may go unnoticed.

The scope of the problem is substantial, affecting a large portion of the psychiatric patient population. Studies have shown that 17.9% of hospitalized psychiatric patients have significantly abnormal ECGs, with 7.6% showing prolonged QTc intervals (Ansermot et al., 2019). Furthermore, in real-world settings, 92.7% of patients with QTc prolongation are prescribed at least one QTc-prolonging medication, most commonly risperidone and pantoprazole, two drugs often encountered in the outpatient setting, highlighting the widespread nature of this issue beyond the acute hospital setting (Schulze et al., 2023). The lack of standardized care is evident, as a 2022 survey of pharmacists revealed that only 11.4% of institutions had formal protocols for monitoring QTc intervals, while 32.4% had only an informal process in place (Harb et al., 2024). This inconsistency in care underscores the need for regular, standardized ECG monitoring,

particularly in patients with both medical and psychiatric comorbidities, where the interplay of risk factors heightens the likelihood of adverse cardiac events.

The consequences of failing to monitor QTc intervals in these vulnerable populations can be devastating. Without proper ECG monitoring, patients are at risk of developing preventable arrhythmias such as torsades de pointes, which can result in sudden cardiac death. These outcomes not only increase mortality rates but also escalate healthcare costs due to emergency interventions and hospitalizations. Moreover, the absence of a unified, evidence-based clinical practice guideline further complicates the management of patients on QTc-prolonging drugs, leading to variability in clinical practice and increasing the risk of adverse outcomes (Xiong et al., 2020; Shah et al., 2014).

While guidelines recommend ECG monitoring for patients taking QTc-prolonging medications, a significant knowledge and practice gap exists due to the absence of a unified, evidence-based practice protocol. The lack of standardized care leaves clinicians to make decisions based on their judgment rather than established guidelines, contributing to the inconsistency in patient monitoring. Several regulatory bodies, such as the Food and Drug Administration (FDA) and the American Psychiatric Association (APA), have issued recommendations. However, these guidelines are not uniformly followed or enforced (Funk et al., 2020). This gap in standardization highlights the need for a formal protocol to ensure consistent and appropriate care.

The Tisdale QT Risk Assessment Tool (Tisdale et al., 2013), accessible online at https://www.mdcalc.com/calc/10293/tisdale-risk-score-qt-prolongation (MDCalc, n.d.), aims to address this gap. This tool would provide a streamlined approach to assessing and monitoring QTc prolongation risks, allowing clinicians to make more informed decisions about ECG

monitoring. By standardizing this process, the intervention aims to increase the frequency and consistency of ECG monitoring in psychiatric patients prescribed QTc-prolonging medications, ultimately reducing the risk of adverse cardiac events (Tisdale et al., 2013). The adoption of this evidence-based tool could significantly improve patient outcomes by ensuring that patients at risk of QTc prolongation are appropriately monitored and treated.

In summary, the lack of a unified, evidence-based clinical practice guideline for QTc monitoring in psychiatric patients presents a critical gap in care. The implementation of a standardized risk assessment tool is necessary to ensure consistent ECG monitoring, reduce the risk of adverse cardiac events, and improve patient outcomes. This DNP project aims to illuminate the utility of establishing an evidence-based QTc prolongation risk assessment template to facilitate ECG monitoring of patients on psychotropic medications. The severity of this issue, compounded by the variability in current clinical practices, underscores the urgent need for a standardized approach to QTc monitoring (Xiong et al., 2020).

## Significance

QTc prolongation poses a substantial risk to patient safety, particularly among individuals with comorbid medical and psychiatric conditions who are frequently prescribed psychotropic medications. The absence of a standardized protocol for assessing and monitoring QTc intervals in psychiatric patients creates significant variability in clinical practice, exposing patients to preventable adverse outcomes such as torsades de pointes and sudden cardiac death. This DNP project addresses a critical gap in healthcare by proposing the implementation of an evidence-based QTc prolongation risk assessment tool, such as the Tisdale QT Risk Assessment Tool, to standardize and improve the monitoring of QTc intervals.

The implementation of a QTc prolongation risk assessment template will significantly enhance patient safety by providing a consistent and evidence-based approach to identifying individuals at high risk for QTc prolongation. Psychiatric patients, who are particularly vulnerable due to their higher rates of polypharmacy and chronic medical conditions, will benefit from more systematic and accurate monitoring practices. By reducing the risk of life-threatening arrhythmias, this project has the potential to lower mortality rates and improve the overall quality of care for this high-risk population.

This project highlights the crucial role of psychiatric professionals in ensuring patient safety and effective medication management. The project empowers psychiatric providers to take a proactive role in preventing adverse cardiac events by equipping them with a validated and user-friendly risk assessment tool. Enhanced education and training around the use of the QTc risk assessment tool will increase provider confidence and competence in identifying at-risk patients, fostering evidence-based decision-making and interprofessional collaboration in clinical practice.

From a systemic perspective, implementing a standardized QTc monitoring protocol allows the opportunity to address inconsistencies in clinical practices and aligns with the broader goals of quality improvement and patient safety. By reducing preventable adverse cardiac events, the project is likely to decrease emergency interventions, hospitalizations, and associated healthcare costs. Additionally, adopting a unified approach to QTc monitoring could serve as a model for developing standardized protocols for other high-risk clinical scenarios, promoting a culture of consistency and evidence-based practice care across healthcare settings.

The variability in ECG monitoring practices for QTc prolongation represents a significant patient safety issue, particularly in psychiatric care settings where high-risk factors such as

polypharmacy are common. By addressing this problem, the project ensures that vulnerable populations receive appropriate monitoring and care.

The project's expected benefits are multifaceted. It offers providers a pathway to safer, more consistent care, reducing the risk of fatal arrhythmias and improving health outcomes. It establishes a structured framework for healthcare providers to guide clinical decision-making, bridging the gap between guidelines and practice. On a broader scale, the project aligns with national healthcare priorities, emphasizing patient-centered care, cost containment, and the adoption of evidence-based practices (AHRQ, 2017).

In summary, this DNP project holds significant promise for transforming the approach to QTc monitoring in psychiatric care, addressing a critical gap in clinical practice. By improving patient safety, enhancing advance nursing practice, and advancing the systemic quality of care, the project represents a significant step toward achieving better health outcomes for vulnerable populations.

## Summary of the Literature

### Background: Electrocardiographic Screening for Psychotropic Medications

Electrocardiographic (ECG) screening serves as a fundamental tool in preventing adverse cardiac events related to drug-induced QTc prolongation, particularly in patients on psychotropic medications. The evidence reviewed underscores that while sudden cardiac death (SCD) is relatively rare (Poncet et al., 2015), QTc prolongation significantly increases this risk, especially in patients with additional risk factors such as electrolyte imbalances, advanced age, or polypharmacy involving multiple QTc-prolonging agents (Tisdale et al., 2013). Current guidelines and expert consensus support the selective use of ECG monitoring, primarily in populations at higher risk, rather than advocating for universal screening. For instance, the study

by Shao et al. (2019) aimed to mitigate the impact of psychotropic medications that may increase the risk for torsades de pointes (TdP) in hospitalized patients by proposing an evidence-based protocol for electrocardiogram monitoring of hospitalized patients on psychotropic medications.

## Background: QT Prolongation and Psychotropic Medications

QTc prolongation is one of the most significant cardiac concerns associated with psychotropic medications, including antipsychotics, antidepressants, and other psychoactive drugs like methadone (Funk et al., 2020). QTc prolongation predisposes patients to TdP, which can be fatal if not promptly identified and managed (Tisdale et al., 2013). The relationship between psychotropic medications and QTc prolongation has been well-documented across numerous studies. For example, the review by Funk et al. (2018) explains that psychotropic drugs may prolong cardiac repolarization, thereby increasing TdP risk. It suggests carefully considering both non-pharmacological and pharmacological risk factors before initiating treatment (Funk et al., 2020).

Despite the well-established risk of QTc prolongation, the exact frequency of these arrhythmias in clinical settings remains challenging to assess, as the onset of TdP can be unpredictable (Tisdale et al., 2013). Nevertheless, using a heart-rate-corrected QT interval (QTc) on the ECG remains the primary marker for assessing TdP risk (Funk et al., 2020). In one study, QTc prolongation was found in 6.3% of patients exposed to psychotropic medications, with 0.33% developing TdP (Arunachalam et al., 2018)

### *QT Prolongation*

QT prolongation refers to the lengthening of the QT interval on the electrocardiogram (ECG), indicating delayed ventricular repolarization (Tisdale et al., 2013). This electrical disturbance is a precursor to TdP, a rare but life-threatening form of polymorphic ventricular

tachycardia that can lead to sudden cardiac death if untreated. QTc prolongation is defined by gender-specific thresholds (typically greater than 470 ms in women and greater than 450 ms in men) and is associated with an increased risk of arrhythmia (Tisdale et al., 2013). The prolongation of the QT interval can be drug-induced or exacerbated by underlying medical conditions, electrolyte disturbances, or genetic predispositions such as congenital long QT syndrome. The role of psychotropic medications in prolonging the QT interval has been extensively studied. Medications such as haloperidol, thioridazine, and ziprasidone have been associated with increased QTc intervals, primarily when used in high doses or in combination with other QTc-prolonging agents (Tisdale et al., 2013). The evidence indicates that the risk of QTc prolongation increases significantly with the concurrent use of multiple QTc-prolonging drugs.

### *The Current State of Electrocardiographic Screening for Psychotropic Medications*

Currently, the clinical approach to ECG monitoring in psychiatric patients remains inconsistent. While universal screening is not recommended due to logistical constraints and limited resources, targeted ECG monitoring based on individual risk factors is considered the best practice. Expert consensus documents, such as those by Funk et al. (2020) and the American Psychiatric Association (APA), suggest a risk-based approach to monitoring. Particularly, ECG monitoring is advised for patients with known risk factors such as pre-existing heart disease, electrolyte imbalances, and those taking high-risk psychotropic medications (Funk et al., 2020)

The Tisdale QT Risk Assessment Tool, developed in 2013, provides a validated and reliable method for assessing the risk of QTc prolongation in hospitalized patients. This score takes into account easily obtainable clinical factors, such as age, sex, medication use, and electrolyte levels, allowing clinicians to stratify patients into low-, moderate-, and high-risk

categories (Tisdale et al., 2013). Such tools enable clinicians to prioritize ECG monitoring for those at the highest risk, optimizing the use of limited resources while still preventing potentially fatal arrhythmias (Berling et al., 2018).

### *Barriers to Electrocardiographic Screening for Psychotropic Medications*

Despite the availability of risk assessment tools and guidelines, several barriers limit the widespread implementation of ECG monitoring in psychiatric settings. First, limited resources, particularly in lower income or rural clinics, prevent regular access to ECG machines or cardiology consultations. Additionally, there is a lack of standardization in practice guidelines for ECG monitoring across psychiatric and medical institutions, leading to inconsistent clinical application (Funk et al., 2020).

Another barrier is clinician reluctance to order ECGs due to perceived complexity in interpreting results. Also, some practitioners may also underestimate the risk of QTc prolongation in patients who appear to have stable psychiatric symptoms, neglecting the potential cardiac side effects of medications (Funk et al., 2020)

## Evidence Base to Support Practice Change

The current body of evidence strongly supports a structured, risk-based approach to ECG monitoring for patients on psychotropic medications, particularly those at elevated risk for QTc prolongation and its associated complications, such as Torsades de Pointes (TdP). Tools like the Tisdale QT Risk Assessment Tool (Appendix A) provide a validated and reliable method for identifying high-risk patients and tailoring ECG monitoring strategies. This tool, grounded in robust evidence, enables clinicians to prioritize monitoring resources effectively, thereby reducing the likelihood of adverse cardiac events (Tisdale et al., 2013). By incorporating such

risk stratification tools into clinical practice, the project seeks to mitigate cardiac risks through systematic and evidence-based practice monitoring protocols.

### *Proposed Algorithms and Consensus Guidelines*

The algorithm proposed by Xiong et al. (2020) (Appendix B) further reinforces the utility of structured clinical tools. Developed through expert consensus and a comprehensive literature review, this algorithm provides clinicians with a decision-making framework that balances the risks and benefits of psychotropic treatment for patients with medical and psychiatric comorbidities. By assigning risk scores and emphasizing individualized care, the algorithm aligns with the project's goal of creating a structured yet flexible monitoring protocol. Importantly, it highlights that low-risk individuals may not require routine ECG monitoring, ensuring sensible and thoughtful use of resources while safeguarding patient outcomes.

### *Professional Endorsements and Resource Documents*

The APA Council on Consultation-Liaison Psychiatry's Work Group on QTc Prolongation provides further validation for a structured approach to QTc prolongation. Their resource document, approved by the American Psychiatric Association (APA) Joint Reference Committee and officially endorsed by the American College of Cardiology (Funk et al., 2020), underscores the importance of considering well-established risk factors and integrating ECG monitoring into routine psychiatric practice for high-risk populations. While this document is intended as an educational tool rather than a formal guideline, it highlights the critical need for clinicians to be equipped with the skills to measure, calculate, and document QTc intervals. Moreover, it advocates for interdisciplinary collaboration with cardiology, an essential approach that can enhance the effectiveness of the proposed monitoring protocol.

### *Recommendations for Targeted Monitoring*

Shah, Aftab, and Coverdale (2014) further affirm the necessity of targeted ECG monitoring based on patient risk factors and medication profiles. Their findings highlight that while routine ECGs may not be mandatory for all patients, they are critical in specific scenarios, such as prescribing high-risk antipsychotics or treating patients with known cardiac risk factors (Appendix C). These recommendations validate the project's focus on standardized care, ensuring high-risk patients receive appropriate monitoring while avoiding unnecessary interventions for low-risk individuals (Appendix D).

## Purpose and Objectives

This DNP project aims to implement a QTc prolongation risk assessment template—the Tisdale QT Risk Assessment Tool—to facilitate systematic ECG monitoring in patients prescribed psychotropic medications. The objective is to enhance the identification and management of individuals at risk for QTc prolongation by integrating an evidence-based tool into clinical practice. This initiative aims to improve the ease of monitoring, streamline documentation processes, and promote adherence to established guidelines among prescribing providers. By fostering a consistent and proactive approach to assessing QTc risk, the project seeks to reduce the incidence of adverse cardiac events, such as torsades de pointes and sudden cardiac death, while ultimately improving patient safety, clinical outcomes, and the quality of psychiatric care.

## PICO Clinical Question

*Implementing a QTc Prolongation Risk Assessment Template for ECG Monitoring in Patients on Psychotropic Medications.*

**P (Population):** In patients receiving care at RFS (Recovery From Society) Psychiatry, prescribed psychotropic medication

**I (Intervention):** Does the establishment of an easy-to-use QTc prolongation risk assessment template to guide and document clinical decision-making on ECG monitoring

**C (Comparison):** Compared to the current practice of relying solely on clinical judgment without a standardized template

**O (Outcome):** Increased provider confidence in of ECG monitoring practices, ultimately improving patient outcomes related to potential QTc prolongation

## Definition of Terms

### Psychotropic Drugs

Psychotropic drugs refer to medications that affect the central nervous system, influencing mood, thoughts, perceptions, and behaviors. These drugs are used to treat mental health disorders such as depression, anxiety, bipolar disorder, and schizophrenia (Muench & Hamer, 2010).

### Psychiatric Medication Use in Patients

This term refers to the administration and management of medications prescribed to individuals for the treatment of mental health conditions. It encompasses drug selection, dosing, and monitoring to achieve therapeutic outcomes while minimizing adverse effects (Friedman et al., 2018).

### Mental Health Disorders Drug Therapy

Drug therapy for mental health disorders involves the use of medications to alleviate symptoms, improve functioning, and enhance the quality of life for individuals with conditions such as anxiety, depression, and psychosis (American Psychiatric Association, 2013).

**Psychopharmacology**

Psychopharmacology is the scientific study of how psychotropic drugs affect the brain and behavior. It explores mechanisms of action, therapeutic uses, and the potential side effects of these medications (Muench & Hamer, 2010).

**Drug Therapy in Psychiatry**

Refers to the application of psychotropic medications as part of a treatment plan for psychiatric conditions. It involves evidence-based prescribing practices tailored to individual patient needs (Friedman et al., 2018).

**Psychotropic Agents Adverse Effects**

Adverse effects of psychotropic agents are unintended and often harmful side effects associated with the use of psychiatric medications. These can range from mild symptoms, such as dry mouth and drowsiness, to severe outcomes, including QTc prolongation and cardiac arrhythmias (Tisdale et al., 2013; Xiong et al., 2020).

**Clinical Decision-Making Tool**

A clinical decision-making tool is an evidence-based resource designed to assist healthcare providers in risk assessment, diagnosis, and determining appropriate treatment strategies. This project refers explicitly to the QTc prolongation risk assessment template (Tisdale et al., 2013).

**ECG Monitoring/EKG Monitoring**

ECG (electrocardiogram) or EKG (the German language abbreviation of electrocardiogram) monitoring is a diagnostic procedure that records the heart's electrical activity over time. It detects abnormalities, including QTc prolongation, which indicates an increased risk of arrhythmias (Funk et al., 2020).

### QT Prolongation/QTc Prolongation

QT prolongation refers to an extended QT interval duration on an ECG, measuring ventricular depolarization and repolarization. QTc prolongation accounts explicitly for heart rate variations, providing a corrected QT interval value. Both conditions are associated with an increased risk of torsades de pointes and sudden cardiac death (Tisdale et al., 2013; Xiong et al., 2020).

## Conceptual Underpinning and Theoretical Framework of the Project

The DNP project on QTc prolongation risk assessment in patients prescribed psychotropic medications will be guided by the Health Belief Model (HBM) and underpinned by a conceptual framework that focuses on key variables that facilitate the effective implementation of the QTc risk assessment tool. The integration of these frameworks will guide the project's design, implementation, and evaluation to improve ECG monitoring practices in psychiatric care (Maiman & Becker, 1974).

### Theoretical Framework: The Health Belief Model (HBM)

The Health Belief Model (HBM) will serve as the theoretical framework for this DNP project. Rooted in psychological and behavioral theory, the HBM (Maiman & Becker, 1974) theorizes that health-related behaviors are influenced by an individual's perceptions of illness and the perceived benefits or barriers to taking preventive actions. The model identifies six key constructs that influence health behavior, which are particularly relevant in understanding and changing clinical decision-making in the context of QTc prolongation monitoring:

- Perceived Susceptibility: This refers to the healthcare provider's perception of the likelihood that their patients will experience QTc prolongation due to the use of psychotropic medications. In the context of the project, it assesses how providers view the risk of QTc prolongation in patients on these medications.

- Perceived Severity: This construct reflects providers' understanding of the seriousness of QTc prolongation, particularly its potential consequences, such as torsades de pointes (TdP) or sudden cardiac death. Provider awareness of these severe outcomes is crucial for motivating proactive ECG monitoring.
- Perceived Benefits: Providers will evaluate the advantages of regularly monitoring QTc intervals, such as reducing the risk of life-threatening arrhythmias and improving patient safety. The HBM suggests that if providers believe ECG monitoring can lead to better outcomes, they will be more likely to implement it.
- Perceived Barriers: This construct examines the challenges that healthcare providers encounter when implementing ECG monitoring, including time constraints, limited resources, or a perceived lack of necessity. The project will focus on addressing these barriers by simplifying the process and improving access to monitoring tools.
- Cues to Action: These are stimuli that prompt providers to take action, either internally (e.g., personal concern for patient health) or externally (e.g., institutional policies or guidelines). The QTc risk assessment tool will serve as a cue to action, providing a structured, evidence-based approach to ECG monitoring.
- Self-Efficacy: Self-efficacy refers to providers' confidence in their ability to utilize the QTc risk assessment tool effectively and implement ECG monitoring in clinical practice. Increasing self-efficacy through training and clear protocols will enhance providers' willingness and ability to follow guidelines consistently.

The Health Belief Model thus provides a framework for understanding the factors that influence healthcare providers' decision-making processes. It enables the identification of strategies to enhance the implementation of ECG monitoring for QTc prolongation in patients prescribed psychotropic medications (Maiman & Becker, 1974).

**Conceptual Framework**

The conceptual framework for this project integrates the HBM constructs with specific variables that align with the project's objectives. These variables and their relationships are essential for ensuring the successful implementation and evaluation of the QTc risk assessment tool.

Key concepts in the framework include:

- Psychiatric Patients: The QTc risk assessment tool is being developed for this patient population. Due to comorbidities and polypharmacy, they have unique healthcare needs.
- QTc Prolongation and Torsades de Pointes: The project addresses these primary clinical concerns. QTc prolongation is a key risk factor for arrhythmias like torsades de pointes, which can lead to sudden cardiac death.
- Psychotropic Medications: These medications, commonly prescribed in psychiatric care, are a primary cause of QTc prolongation in patients.
- ECG Monitoring: Regular ECG monitoring is the primary intervention for detecting and preventing adverse cardiac events caused by QTc prolongation.

The QTc risk assessment tool serves as the intervention within this framework.

It is designed to:

- Reduce Perceived Barriers: The tool will help overcome barriers such as time constraints and resource limitations by simplifying the documentation and monitoring process.

- Increase Self-Efficacy: By making ECG monitoring easier and more consistent, the tool will enhance providers' confidence in their ability to adhere to guidelines and improve patient outcomes.

This conceptual framework emphasizes the integration of evidence-based practices and clinical guidelines into healthcare providers' daily workflows, ensuring more consistent and effective decision-making related to patient care. By addressing the barriers to ECG monitoring and enhancing providers' self-efficacy, the framework aims to improve adherence to monitoring guidelines, reduce the risk of harm due to QTc prolongation, and ultimately improve patient outcomes.

**Alignment of Frameworks in Project Design, Implementation, and Evaluation**

Integrating the Health Belief Model and conceptual framework will guide the projects development, implementation, and evaluation of the QTc risk assessment tool.

- Design: The tool will emphasize usability, address barriers such as time constraints and resource limitations, and enhance providers' confidence in its use. The design will also take into account the specific needs of the patient population, including comorbidities and the use of multiple medications.
- Implementation: The project will implement the tool through training and educational sessions designed to enhance providers' understanding of the risks associated with QTc prolongation and their ability to utilize the tool effectively. It will also incorporate cues to action, such as institutional support and reminders.
- Evaluation: The tool's effectiveness will be evaluated based on changes in providers' self-reported likelihood to assess QTc risk before and after the presentation, the perceived usefulness of the educational content, and their intent to implement the Tisdale QT Risk

Assessment Tool in practice. The evaluation will also explore providers' confidence and engagement in ECG monitoring, as well as anticipated barriers to implementation, reflecting key elements of self-efficacy and readiness to change.

In conclusion, this DNP project aims to enhance clinical decision-making and mitigate the risks associated with QTc prolongation by integrating the HBM with a conceptual framework that focuses on psychiatric patients, psychotropic medications, and ECG monitoring. The use of a structured, evidence-based risk assessment tool will facilitate a more standardized and consistent approach to monitoring, ultimately improving the safety and quality of care for this vulnerable patient population.

## Methodology

### Setting and Participants

The DNP project was conducted at RFS (Recovery From Society) Psychiatry, a mental health practice located at 412 E. Madison St., Suite 1012, Tampa, Florida, 33602. RFS Psychiatry provides a comprehensive range of psychiatric services designed to support patients across the continuum of mental health care. These services include individualized medication management plans to optimize psychiatric outcomes, diverse psychotherapy modalities to address emotional and psychological challenges, and consulting services to enhance mental health delivery through external organizational partnerships.

The clinic serves a broad adult population with psychiatric diagnoses such as ADHD, depression, bipolar disorder, PTSD, schizophrenia, OCD, borderline personality disorder, and various anxiety-related disorders. To enhance accessibility and convenience, services are offered in-person and via telehealth, Monday through Friday, from 9:00 AM to 5:00 PM.

The project engaged one primary participant group: psychiatric clinicians at RFS Psychiatry who are responsible for prescribing psychotropic medications and monitoring QTc intervals. The inclusion criteria required that participants be licensed prescribing providers (e.g., psychiatrists and psychiatric nurse practitioners) who were actively involved in medication management. Clinicians who do not prescribe medications or are not directly involved in QTc monitoring were excluded from participation.

Key stakeholders involved in the project included psychiatric prescribing providers and administrative personnel at RFS Psychiatry. Prescribing providers played a central role in implementing and evaluating the QTc prolongation risk assessment tool, while administrative personnel supported workflow integration.

**Description of Approach and Project Procedures**

The project was implemented by introducing the Tisdale QT Risk Assessment Tool to psychiatric prescribing providers at RFS Psychiatry through a structured educational PowerPoint presentation. The session outlined the clinical significance of QTc prolongation, explained the components and use of the Tisdale tool, and demonstrated how to access and integrate the tool within the existing electronic health record system, TherapyNotes. Following the presentation, providers were invited to complete a brief survey evaluating the perceived usefulness of the content, their self-reported likelihood to assess QTc risk before and after the presentation, and their intention to implement the tool in clinical practice. The DNP student collected and reviewed these survey responses to assess provider engagement, identify potential barriers to implementation, and evaluate the overall impact of the intervention on clinical practice behaviors.

## Instruments and Tools

The primary instrument for this project was the Tisdale QT Risk Assessment Tool (Appendix A), a validated resource and reliable tool used to evaluate QTc prolongation risk in patients prescribed psychotropic medications (Tisdale et al., 2013). The tool was integrated directly into the TherapyNotes EHR system via a shared website link, https://www.mdcalc.com/calc/10293/tisdale-risk-score-qt-prolongation (MDCalc, n.d.), to streamline workflow and ensure accessibility during patient encounters. Supplemental tools included provider-focused educational materials, live training presentations, and an anonymous electronic survey administered via SurveyMonkey post-presentation (Appendix H). The survey assessed provider knowledge, attitudes, self-reported practices, and perceived barriers to the consistent use of the tool in clinical decision-making.

## Protection of Human Subjects

Participants were recruited during scheduled team meetings and clinical communications at RFS Psychiatry. Psychiatric prescribing providers were introduced to the quality improvement project through email and team briefings, where they received detailed information about the project's purpose, their role in completing the survey, and the voluntary nature of participation. Written informed consent (Appendix E) was obtained from each provider prior to survey completion, with clear communication of their right to decline or withdraw at any time without penalty.

The project posed minimal risk to participants, as it involved an educational presentation and a post-intervention survey (Appendix H) evaluating provider perspectives, intentions, and self-reported behaviors. There were no procedures involving patients, direct medical interventions, or physical risks. Benefits included increased provider awareness of QTc

prolongation risks, improved confidence in ECG monitoring practices, and potential long-term enhancement in patient safety.

To protect participant privacy, all survey data was collected anonymously via SurveyMonkey and stored in a password-protected account accessible only to the DNP student and project faculty advisor. No identifiable personal or clinical data was collected.

Prior to implementation, the project received Institutional Review Board (IRB) exemption approval from Florida International University (Exemption #IRB-25-0034; Appendix F), confirming compliance with ethical standards for human subjects research. The DNP student also completed CITI Program training in research ethics (Appendix G). Throughout the project, participant autonomy and data confidentiality were prioritized in accordance with institutional ethical best practices.

**Ethical Considerations**

The project received Institutional Review Board (IRB) Exemption approval from Florida International University's IRB on February 11, 2025 (Exemption #IRB-25-0034). Although exempt from full review, all project procedures were conducted in accordance with ethical guidelines, including compliance with HIPAA and the protection of human subjects. Electronic informed consent outlined the project's purpose, procedures, risks, and benefits, emphasizing voluntary participation and the right to withdraw without penalty. Survey data were collected anonymously using random response identifiers provided by SurveyMonkey. All results were stored on a secure, encrypted system and were aggregated before analysis to ensure participant anonymity and data confidentiality.

## Data Collection

Data for this Doctor of Nursing Practice (DNP) project was collected through a structured post-intervention survey administered to psychiatric prescribing providers at RFS Psychiatry. The survey (Appendix H) was distributed electronically via SurveyMonkey following an educational presentation on the Tisdale QTc Risk Assessment Tool. The primary outcome measure was the change in providers' self-reported likelihood to assess the risk-benefit ratio of psychotropic medications and QTc prolongation before and after the intervention. Secondary outcomes included the perceived usefulness of the presentation, intent to implement the tool, and anticipated barriers to implementation.

Survey items were designed to align with the project's goals and included both Likert-scale and multiple-choice questions. Responses were anonymous and recorded automatically through the secure SurveyMonkey platform. Data was downloaded and cleaned in Microsoft Excel for analysis.

The evaluation focused on process and outcome indicators. Process measures included provider participation in the survey and engagement with the educational content. Outcome measures included the magnitude of change in self-reported likelihood to assess QTc risk, intent to use the Tisdale tool in practice, and identification of common implementation barriers. Data were analyzed using descriptive statistics and Cohen's d to assess the effect size of the intervention, providing evidence of its impact on clinical practice behavior.

## Data Management

All project data were collected and managed by the DNP student using SurveyMonkey, a secure, web-based survey platform. The survey was designed to be anonymous, with no

collection of personal identifiers. Responses were stored in a password-protected SurveyMonkey account accessible only to the DNP student and faculty advisor.

Data was exported to Microsoft Excel for analysis, where they were stored on a secure, encrypted device. All responses were de-identified and analyzed in aggregate to ensure confidentiality and protect participant privacy. No data was entered into or stored within the TherapyNotes electronic health record system, as the project did not involve patient records or clinical documentation.

Data management procedures adhered to Florida International University's IRB exemption guidelines (Exemption #IRB-25-0034; Appendix F) and all ethical standards for confidentiality and secure handling of research data were strictly followed throughout the project.

**Data Analysis Plan**

This quality improvement project employed a quantitative, one-group pretest-posttest design to evaluate the effectiveness of an educational intervention introducing the Tisdale QTc Risk Assessment Tool. Survey data were collected from five psychiatric providers following the intervention. The survey measured providers' self-reported likelihood of assessing QTc risk before and after the intervention, their perceived usefulness of the content, their intent to implement the tool, and the perceived barriers to implementation.

Descriptive statistics (frequencies and percentages) were used to summarize responses to each survey item. For statistical analysis, Cohen's d was used to assess the effect size of the intervention by comparing the mean pre-intervention and post-intervention scores for the likelihood of assessing QTc risk (Questions 2 and 3) (Appendix H). Scores were assigned numerically (Excellent = 5, Very Good = 4, Good = 3, Fair = 2, Poor = 1). Cohen's d is

calculated by subtracting the pre-intervention mean from the post-intervention mean and then dividing the result by the pooled standard deviation, a method known as the standardized mean difference (SMD) (Polit & Beck, 2021).

This analysis aimed to determine whether the educational session produced a meaningful change in provider behavior. Cohen's interpretation thresholds were used: small (0.2), medium (0.5), and large (0.8) effect sizes. Additional survey responses were analyzed using categorical frequency counts to assess perceived usefulness, implementation intent, and barriers to adoption.

**Timeline**

The following timeline was developed to complete the project within a 7-month period, ensuring alignment with academic requirements and clinical site coordination:

Project Planning & Preparation (January–March 2025)

- Task 1: Secured site support from RFS Psychiatry and confirmed provider participation.
- Task 2: Developed and finalized the DNP project proposal, including survey instruments.
- Task 3: Submitted project protocol and obtained IRB exemption approval from Florida International University (IRB #IRB-25-0034).
- Task 4: Created educational materials and finalized the post-intervention provider survey.

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Implementation Phase (April–June 2025)

- Task 5: Delivered an educational presentation to psychiatric prescribing providers at RFS Psychiatry, introducing the QTc Risk Assessment Tool and its clinical relevance.
- Task 6: Administered a structured post-intervention survey via SurveyMonkey to evaluate provider perceptions, intent to implement the tool, and anticipated barriers.
- Task 7: Collected and secured survey responses for analysis.

Evaluation & Dissemination (June–July 2025)

- Task 8: Analyzed survey results using descriptive statistics and calculated Cohen's *d* to determine the effect size of the intervention.
- Task 9: Summarized outcomes related to provider engagement, confidence in QTc assessment, and implementation intent.
- Task 10: Completed final project report, including findings, limitations, and sustainability considerations.
- Task 11: Disseminated project results to clinical site stakeholders and submitted project materials for academic evaluation.

This timeline outlines a streamlined, goal-oriented implementation plan centered on action-based deliverables, with a focus on enhancing provider knowledge and readiness to assess QTc prolongation risk. It remained adaptable to ensure the completion of critical milestones and aligns with the overarching goal of enhancing ECG monitoring practices and provider-driven risk management in the psychiatric care setting.

## Results

The primary goal of this quality improvement project was to enhance psychiatric providers' confidence and consistency in assessing the risk of QTc prolongation associated with psychotropic medications. A structured educational intervention introduced the Tisdale QTc Risk Assessment Tool, followed by a five-question survey to evaluate provider perceptions, intent to implement, and anticipated barriers. All five providers at RFS Psychiatry participated, yielding a 100% response rate.

**Usefulness of the Presentation (Q1)**

All five respondents (100%) rated the presentation as "Extremely Useful," indicating strong provider engagement and a high perceived value of the intervention content. This level of agreement reflects remarkable consistency and indicates a shared recognition of the importance of structured QTc risk assessment in psychiatric practice.

**Table 1**

*Usefulness of the Presentation*

| Response | Frequency | Percentage |
|---|---|---|
| Extremely Useful | 5 | 100% |
| All Other Options | 0 | 0% |

**Likelihood to Assess QTc Risk – Pre vs Post (Q2 & Q3)**

Participants were asked to rate their likelihood to assess the risk-benefit ratio of psychiatric medications and QTc prolongation before and after the educational intervention. The results are shown in Table 2.

**Table 2**

*Likelihood to Assess QTc Risk – Pre vs Post Results*

| **Rating** | **Pre-intervention** | **Post-intervention** |
|---|---|---|
| **Excellent, n (%)** | 4 (80%) | 5 (100%) |
| **Good, n (%)** | 1 (20%) | 0 (0%) |
| **Mean Score (M)** | 4.6 | 5.0 |
| **Standard deviation (SD)** | 0.55 | 0.00 |

**Cohen's *d* Calculation**

Using standard methodology (Polit & Beck, 2021), the effect size was calculated as $d = 1.03$, indicating a large and clinically meaningful effect. This result supports the effectiveness of the intervention in increasing provider confidence in QTc assessment practices.

**Table 3**

*Likelihood to Assess QTc Risk Before and After Presentation*

| Time Point | Mean Score | Standard Deviation | Interpretation |
|---|---|---|---|
| Pre-Intervention | 4.6 | 0.55 | High confidence |
| Post-Intervention | 5.0 | 0.00 | Maximum confidence |
| Cohen's *d* | 1.03 | — | Large effect size |

**Intent to Implement the QTc Tool (Q4)**

Four of five respondents (80%) indicated that they plan to implement the Tisdale tool in their clinical practice, while one provider (20%) expressed a need for more information. No respondents declined implementation or considered the tool irrelevant to current practice.

**Table 4**

*Intent to Implement the QTc Tool*

| Response | Frequency | Percentage |
|---|---|---|
| I plan to implement the tool | 4 | 80% |
| I need more information | 1 | 20% |
| No intent to implement / already practicing similarly | 0 | 0% |

### Anticipated Barriers to Implementation (Q5)

When asked about potential challenges, providers identified time constraints (40%) and patient adherence/compliance (40%) as the most prominent barriers. One respondent (20%) selected "Other," although no specific barrier was provided, as they wrote "N/A" in the free text box on the survey. No participants reported systemic or team-related obstacles.

**Table 5**

*Anticipated Barriers to Implementation*

| Barrier | Frequency | Percentage |
|---|---|---|
| Time Constraints | 2 | 40% |
| Patient Adherence | 2 | 40% |
| Other (Unspecified) | 1 | 20% |
| All Other Barriers | 0 | 0% |

### Discussion of Results

The results of this quality improvement project demonstrate a high level of provider engagement and perceived value, with 100% of participants rating the educational presentation as “extremely useful.” The average provider’s confidence in assessing QTc risk increased from an already high mean of 4.6 to a perfect post-intervention score of 5.0. This shift was accompanied by a calculated Cohen’s d of 1.03, indicating a large and clinically meaningful effect size. All providers reported maximum confidence after the training, with no variation in response, signaling strong consistency and impact. Additionally, 80% of respondents expressed intent to implement the Tisdale QTc Risk Assessment Tool in practice, further supporting the operational relevance of the intervention. Time constraints and patient adherence were the most

cited barriers, suggesting that future efforts should focus on workflow optimization through provider- and patient- centered strategies, such as embedding templates within the EHR charting system or automating score calculation, onsite ECG capabilities or direct resource referral. Overall, the results provide compelling evidence that the intervention significantly enhanced provider confidence and readiness to improve ECG monitoring practices, reinforcing the tool's value as a sustainable clinical practice.

## Discussion

### Interpretation of Results

The results of this quality improvement (QI) project strongly support the effectiveness of implementing a standardized QTc Prolongation Risk Assessment Template into psychiatric practice. All participating providers (100%) rated the presentation content as extremely useful to their professional development, and post-intervention survey responses indicated a consistent increase in provider confidence. The pre-intervention confidence score averaged 4.6 on a 5-point Likert scale, while the post-intervention score rose to a perfect 5.0. With no variation in post-survey responses, this demonstrated a high level of uniform confidence among providers after the intervention. A Cohen's d value of 1.03, which denotes a large effect size (Polit & Beck, 2021), further reinforces the intervention's clinical relevance and educational impact.

This remarkable consistency across respondents supports the operational change of embedding the QTc template into the TherapyNotes electronic health record (EHR). Additionally, 80% of respondents expressed a clear intent to implement the Tisdale tool in their practice, demonstrating strong potential for sustained behavioral change.

## Comparison to Existing Literature

The findings align with previous research emphasizing the critical need for ECG monitoring in psychiatric populations due to psychotropic medication–induced QTc prolongation (Arunachalam et al., 2018; Funk et al., 2020; Muench & Hamer, 2010). Similar to the findings of Shao et al. (2019) and Harb et al. (2024), this project identified knowledge gaps and practice inconsistencies that may compromise patient safety.

The use of the Tisdale Risk Score—a validated tool for stratifying QTc risk—enabled clinicians to systematically assess cardiac risk, in line with recommendations by Berling et al. (2018) and Tisdale et al. (2013). This project's strong post-intervention results and unanimous confidence increase mirror findings by Schulze Westhoff et al. (2023), who emphasized the importance of provider training and standardized protocols for QTc monitoring.

Notably, the primary barriers identified in this project—time constraints and patient adherence—were consistent with the literature (Funk et al., 2020; Shah et al., 2014). These constraints often hinder the implementation of ECG monitoring despite established guidelines. Addressing these barriers through workflow optimization with provider- and patient- centered strategies, such as template embedment within the EHR charting system or automating score calculation, onsite ECG capabilities or direct resource referral, will be essential for long-term success.

## Sustainability Plan

To ensure sustainability, the QTc Risk Assessment Template has been permanently linked to the TherapyNotes EHR through direct integration with the MDCalc (MDCalc, n.d.) Tisdale Risk Score for QT prolongation calculator (https://www.mdcalc.com/calc/10293/tisdale-risk-score-qt-prolongation) link. Ongoing reinforcement will include annual provider refresher

training, audit-and-feedback loops, and support from the clinic's clinical administrator to oversee adherence. These strategies align with the Agency for Healthcare Research and Quality's (AHRQ) Practice Facilitation Handbook, which emphasizes the importance of integrating new tools into the workflow, providing clinicians with technical and peer support, and reinforcing learning over time (AHRQ, 2017).

**Dissemination Plan**

Findings from this QI project will be disseminated to key stakeholders through internal presentations at RFS Psychiatry, submission to the Florida International University (FIU) DNP repository, and potential publication in a peer-reviewed psychiatric nursing or quality improvement journal. A poster presentation proposal will also be submitted for the 13th Annual VA Advanced Practice Provider (APP) Symposium, themed "Topics in Pharmacotherapy," scheduled for November 7, 2025. Hosted in partnership with Duke University School of Nursing, this national symposium provides an opportunity to disseminate the project's findings across a multidisciplinary audience of advanced practice providers, including nurse practitioners, pharmacists, and physician assistants (VA APP Symposium Committee, 2025).

**Implications for Advanced Practice Nursing**

The results of this project have significant implications for advanced practice nurses (APNs), especially those working in mental health. By equipping providers with a structured, evidence-based tool for cardiac risk assessment, this project enhances the quality and safety of psychiatric care. APNs play a critical role in implementing best practices and leading system-wide change. Findings from this intervention can serve as a catalyst for policy development that mandates QTc risk assessment and ECG monitoring protocols for psychiatric patients on high-risk medications—addressing a critical safety gap in behavioral health. Furthermore, the project

highlights the need for ongoing provider education around cardiac risk management in psychiatry, suggesting that ECG monitoring should become an integral part of annual competency training for prescribing clinicians. The success of this project underscores its potential to improve clinical outcomes, promote patient safety, and standardize care delivery in complex outpatient settings.

From a systems perspective, this quality improvement initiative contributes to the broader advance practice nursing evidence base by demonstrating the feasibility and impact of integrating structured assessment tools into clinical workflows. It also provides a replicable model that can inform similar QI projects in other outpatient mental health or primary care settings. As such, the project emphasizes the APN's role as a change agent—not only at the individual practice level but also in fostering system-wide quality improvement and advocating for continuous professional development.

In conclusion, this project exemplifies how DNP-prepared nurses can lead initiatives that align clinical care with best practices, address patient safety risks, and inform the future direction of healthcare policy, education, and research. APNs must continue to build upon these foundational efforts by replicating and scaling similar projects, collaborating across disciplines, and engaging in ongoing scholarship to sustain improvements in practice and advance the standard of care for vulnerable patient populations.

## Limitations

This quality improvement (QI) project is subject to several limitations that may influence the interpretation and generalizability of its findings. The small sample size (N = 5) restricts statistical power and the ability to detect the impact of other confounding variables, thus limiting the robustness of conclusions drawn. This single-site approach may limit the external validity of

the findings, as the patient population, provider practices, and organizational workflows at RFS Psychiatry may differ significantly from other outpatient psychiatric or primary care settings. Additionally, the use of convenience sampling from a single outpatient psychiatric clinic (RFS Psychiatry) introduces potential selection bias, further limiting the applicability of the findings to broader psychiatric care environments. Response bias is an anticipated concern; despite the use of anonymous electronic surveys via SurveyMonkey, providers may still have been inclined to report favorable views due to professional rapport with the project lead or perceived expectations from leadership.

## Recommendations

Future projects should aim for multi-site implementation with larger sample sizes to enhance statistical power and external validity. The inclusion of patient outcome data, such as ECG completion rates and identified QTc abnormalities, would further strengthen the evidence base. Embedding the QTc tool directly into EHR workflows, along with automated prompts, could enhance clinical adoption. Additionally, targeted education addressing patient adherence and time management strategies could mitigate identified barriers.

## Conclusions

This quality improvement project demonstrated the successful implementation of a standardized QTc Prolongation Risk Assessment Template in an outpatient psychiatric setting. The educational intervention, paired with the integration of the Tisdale QTc Risk Assessment Tool, significantly enhanced provider confidence, intent to implement, and overall satisfaction. The large effect size and consistency in survey responses underscore the clinical relevance and feasibility of adopting this tool in routine psychiatric practice. By embedding the intervention into provider workflows through training, EHR integration, and administrative oversight, the

project offers a sustainable and replicable model for improving cardiac safety in patients receiving psychotropic medications. Ultimately, these findings confirm the crucial role of advanced practice nurses in spearheading evidence-based initiatives that enhance patient safety and elevate the standard of psychiatric care.

## References

Agency for Healthcare Research and Quality. (2017). *Practice facilitation handbook.* https://www.ahrq.gov/ncepcr/tools/pf-handbook/index.html

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). *American Psychiatric Publishing*.

Ansermot, N., Bochatay, M., Schläpfer, J., Gholam, M., Gonthier, A., Conus, P., & Eap, C. B. (2019). Prevalence of ECG abnormalities and risk factors for QTc interval prolongation in hospitalized psychiatric patients. *Therapeutic Advances in Psychopharmacology*, 9, 2045125319891386. https://doi.org/10.1177/2045125319891386

Arunachalam, K., Lakshmanan, S., Maan, A., Kumar, N., & Dominic, P. (2018). Impact of drug induced long qt syndrome: A systematic review. Journal of Clinical Medicine Research, 10(5), 384–390. https://doi.org/10.14740/jocmr3338w

Berling, I., Gupta, R., Bjorksten, C., Prior, F., Whyte, I. M., & Berry, S. (2018). A review of ECG and QT interval measurement use in a public psychiatric inpatient setting. Australasian Psychiatry: Bulletin of Royal Australian and New Zealand College of Psychiatrists, 26(1), 50–55. https://doi.org/10.1177/1039856217726212

Friedman, R. A., Stankov, S., & Friedman, J. H. (2018). Pharmacotherapy for mental health conditions. *Journal of Clinical Psychiatry*, 79(5), 21–28.

Funk, M., Beach, S., Bostwick, J., Celano, C., Hasnain, M., Pandurangi, A., Khandai, A., Taylor, A., Levenson, J., Riba, M., & Kovacs, R. (2020). Resource document on qtc prolongation and psychotropic medications. *American Journal of Psychiatry,* 177(3), 273–274. https://doi.org/10.1176/appi.ajp.2019.1760501

Harb, K., Schwartz, S., & Cooper, J. (2024). Pharmacist reported protocols for qtc monitoring of psychiatric medications. *Cureus*, 16(3), e57192. https://doi.org/10.7759/cureus.57192

Maiman, L. & Becker, M. (1974). The Health Belief Model: Origins and Correlates in Psychological Theory. Health Education Monographs, 2(4), 336–353. https://doi.org/10.1177/109019817400200404

Malone, K. & Hancox, J. C. (2020). QT interval prolongation and Torsades de Pointes with donepezil, rivastigmine and galantamine. *Therapeutic Advances in Drug Safety*, 11, 1–14. https://doi.org/10.1177/2042098620942416

MDCalc. (n.d.). Tisdale Risk Score for QT prolongation. Retrieved July 6, 2025, from https://www.mdcalc.com/calc/10293/tisdale-risk-score-qt-prolongation

Muench, J., & Hamer, A. M. (2010). Adverse effects of antipsychotic medications. *American Family Physician*, 81(5), 617–622. https://pubmed.ncbi.nlm.nih.gov/20187598/

National Institutes of Health (n.d). Systematic Review Protocols and Protocol Registries. https://www.nihlibrary.nih.gov/services/systematic-review-service/systematic-review-protocols-and-protocol-registries

Polit, D., & Beck, C. (2017). Nursing research: Generating and assessing evidence for nursing practice. Wolters Kluwer.

Polit, D. F., & Beck, C. T. (2021). Nursing research: Generating and assessing evidence for nursing practice (11th ed.). Wolters Kluwer.

Poncet, A., Gencer, B., Blondon, M., Gex-Fabry, M., Combescure, C., Shah, D., Schwartz, P. J., Besson, M., & Girardin, F. R. (2015). Electrocardiographic screening for prolonged qt interval to reduce sudden cardiac death in psychiatric patients: A cost-effectiveness analysis. PloS One, 10(6), e0127213. https://doi.org/10.1371/journal.pone.0127213

Recovery From Society Psychiatry. (n.d.). Home. Retrieved November 24, 2024, from https://recoveryfromsociety.com/

Schulze Westhoff, M., Schröder, S., Heck, J., Pfister, T., Jahn, K., Krause, O., Wedegärtner, F., Bleich, S., Kahl, K., Krüger, T., & Groh, A. (2023). Determinants of severe QTc prolongation in a real-world gerontopsychiatric setting. *Frontiers in Psychiatry*, 14, 1157996. https://doi.org/10.3389/fpsyt.2023.1157996

Shah, A., Aftab, A., & Coverdale, J. (2014). QTc prolongation with antipsychotics: Is routine ECG monitoring recommended? J Psychiatr Pract, 20(3), 196–206. https://doi.org/10.1097/01.pra.0000450319.21859.6d

Shao, W., Ayub, S., Drutel, R., Heise, W.C., & Gerkin, R. (2019). QTc prolongation associated with psychiatric medications: a retrospective cross-sectional study of adult inpatients. J Clin Psychopharmacol, 39(1), 72-77. https://doi.org/10.1097/JCP.0000000000000992

Tisdale, J., Jaynes, H., Kingery, J., Mourad, N., Trujillo, T., Overholser, B., & Kovacs, R. (2013). Development and validation of a risk score to predict QT interval prolongation in hospitalized patients. *Circulation: Cardiovascular Quality and Outcomes*, *6*(4), 479–487. https://doi.org/10.1161/CIRCOUTCOMES.113.000152

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., Lewin, S., … Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. Annals Of Internal Medicine, 169(7), 467–473. https://doi.org/10.7326/M18-0850

VA Advanced Practice Provider (APP) Symposium Committee. (2025). 13th Annual VA APP Symposium: Topics in Pharmacotherapy [Call for abstracts]. *U.S. Department of Veterans Affairs*. https://dvagov.sharepoint.com/sites/vhaapp2025

Woosley, R. L., Heise, C. W., Gallo, T., Tate, J., Woosley, D., & Romero, K. A. (2013). QTdrugs List Search. *CredibleMeds*. Retrieved from www.CredibleMeds.org

Xiong, G., Pinkhasov, A., Mangal, J., Huang, H., Rado, J., Gagliardi, J., Demoss, D., Karol, D., Suo, S., Lang, M., Stern, M., Spearman, E., Onate, J., Annamalai, A., Saliba, Z., Heinrich, T., & Fiedorowicz, J. (2020). QTc monitoring in adults with medical and psychiatric comorbidities: Expert consensus from the association of medicine and psychiatry. *Journal of Psychosomatic Research*, 135, 110138. https://doi.org/10.1016/j.jpsychores.2020.110138

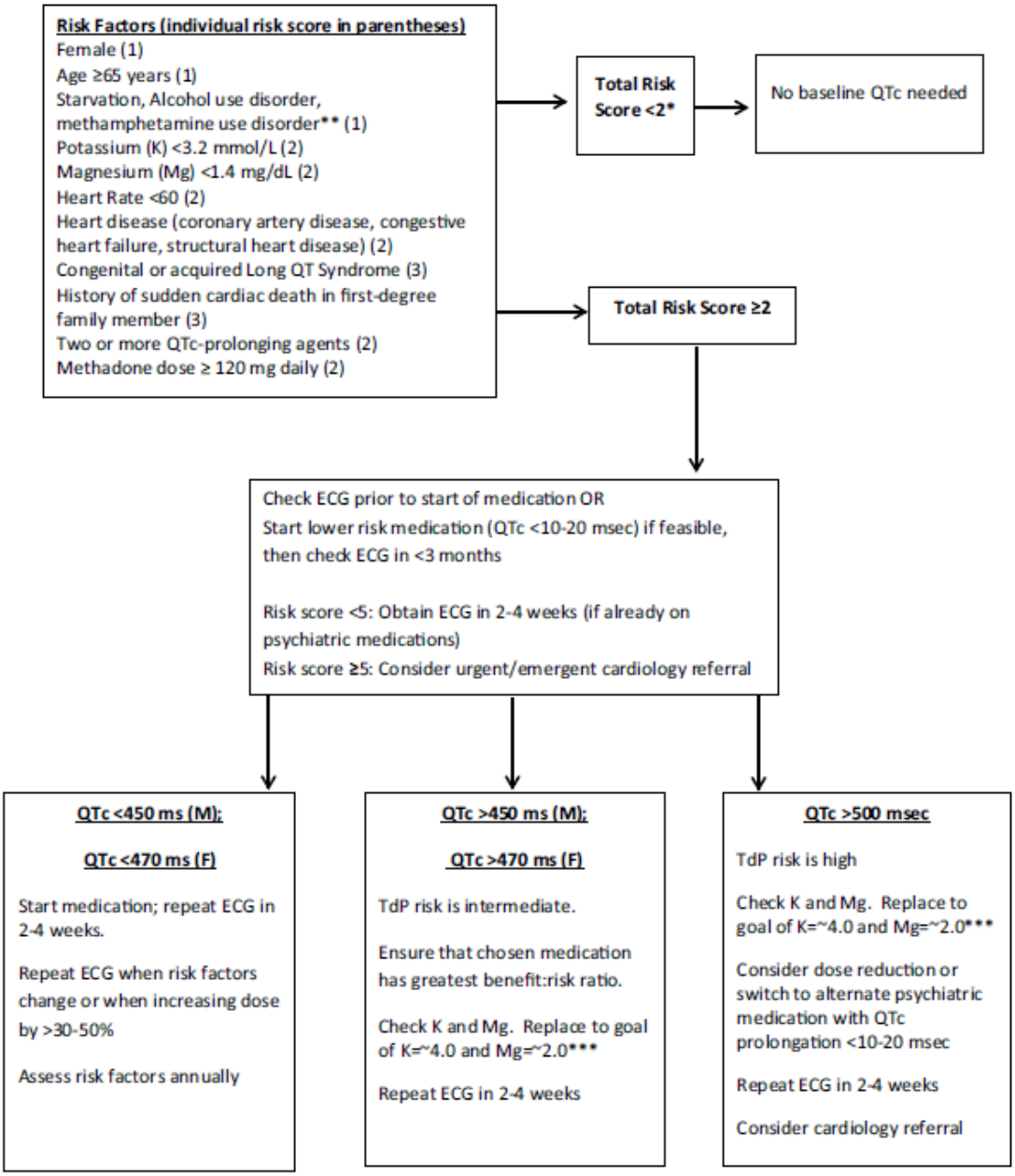
# Appendices

## Appendix A: Tisdale QT Risk Assessment, Tisdale et al. (2013)

| Risk Score For Drug-Associated QTc Prolongation | |
|---|---|
| Risk Factor | Points |
| Age 68 years or older | 1 |
| Female sex | 1 |
| Loop diuretic | 1 |
| Serum potassium 3.5 mEq/L or less | 2 |
| Admission QTc 450 milliseconds or greater | 2 |
| Acute myocardial infarction | 2 |
| 2 or more QTc-prolonging drugs | 3 |
| Sepsis | 3 |
| Heart failure | 3 |
| One QTc-prolonging drug | 3 |
| Abbreviations: QTc - Corrected QT | |

| Risk Levels For Drug-Associated QT Prolongation | |
|---|---|
| 6 points or less | Low risk |
| 7 to 10 points | Moderate risk |
| 11 points or greater | High risk |

**Appendix B: Risk Scoring and Algorithm When Starting and Monitoring QTc Prolonging Medications, Xiong et al. (2020)**



**Appendix C: Table 1. Risk Factors to Evaluate for During Initial Assessment of Patients, Shah, Aftab & Coverdale (2014)**

**Table 1. Risk factors to evaluate for during initial assessment of patients[46,47]**

- Older age (> 65 years of age)
- Electrolyte disturbances (particularly hypokalemia and hypomagnesemia)
- Congenital long QT syndrome/family history of sudden death
- Personal history of heart murmur, shortness of breath with exertion, episodes of tachycardia at rest, irregular heartbeats, and especially, syncope
- Known cardiac disease: myocardial ischemia, congestive heart failure, cardiac arrhythmias, bradycardia
- Concomitant use of other medications known to prolong QTc interval
- Concomitant medications known to inhibit metabolism of antipsychotics/liver disease
- Endocrine and metabolic disorders
- Central nervous system injury: stroke, infection, trauma

# Appendix D: Table 4. Risk Stratification of Antipsychotics, Shah, Aftab & Coverdale (2014)

**Table 4 Risk stratification of antipsychotics**

| *Risk level* | *Antipsychotics* | |
|---|---|---|
| ***High Risk:*** Established QTc prolongation of clinical concern, increased risk of torsade de pointes (TdP) and sudden death<br><br>**ECG monitoring recommended. Do not use in patients with increased cardiac risk.** | Thioridazine<br>Mesoridazine<br>Droperidol<br>Pimozide<br>Haloperidol (IV) > 2 mg cumulative dose | |
| ***Moderate Risk:*** Established QTc prolongation of clinical concern<br><br>**ECG recommended in presence of risk factors. Keep low threshold for cardiac risk status on initial evaluation.** | Ziprasidone<br>Quetiapine[a] | |
| ***Moderate Risk:*** QTc prolongation of little or questionable clinical concern, but linked to reports of TdP<br><br>**ECG recommended in presence of risk factors. Keep low threshold for cardiac risk status on initial evaluation.** | Chlorpromazine<br>Haloperidol (oral)[b] | |
| ***Low Risk:*** QTc prolongation of little or questionable clinical concern<br><br>**ECG recommended in presence of risk factors.** | Aripiprazole<br>Asenapine<br>Clozapine<br>Iloperidone | Olanzapine<br>Paliperidone<br>Risperidone[c] |
| ***Very Low Risk:*** QTc prolongation not of clinical concern<br><br>**ECG recommended in drug overdose.** | Lurasidone | |

*[a]Although we classify both ziprasidone and quetiapine as moderate risk, the QTc elevation associated with ziprasidone is significantly greater than that associated with quetiapine.*
*[b]Oral haloperidol is associated with a very small mean QTc prolongation of 4.7 ms, less than most of the atypical antipsychotics. Nevertheless, there are reports of its association with TdP,[60] which is why it has been classified as moderate risk.*
*[c]The mean QTc prolongation associated with risperidone is 11.6 ms, comparable to that associated with quetiapine (14.5 ms, moderate risk); we have nonetheless classified it as low risk because only 4% of subjects treated with risperidone experienced QTc prolongation > 60 ms compared to 11.1% with quetiapine (Table 1).*

# Appendix E: Consent To Participate in a Quality Improvement Project

FIU | FLORIDA INTERNATIONAL UNIVERSITY

**CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT**
"Implementing a QTc Prolongation Risk Assessment Template for ECG Monitoring in Patients on Psychotropic Medications"

**PURPOSE OF THE PROJECT**
You are being asked to be in a quality improvement project. The goal of this project is to evaluate the effectiveness of a QTc prolongation risk assessment template in enhancing systematic ECG monitoring and clinical adherence among psychiatric providers prescribing psychotropic medications.

**NUMBER OF PROJECT PARTICIPANTS**
If you decide to be in this project, you will be one of four people participating in this research project.

**DURATION OF THE PROJECT**
Your participation is expected to span a total of approximately 4 months. The education session is expected to last approximately 10-15 minutes. The post presentation survey is expected to take approximately 5 minutes to complete.

**PROCEDURES**
If you agree to be in the project, we will ask you to do the following things:
1. Listen to a 10–15-minute educational program about QT/QTc Prolongation and the Tisdale QT Prolongation Risk Assessment
2. Post-presentation you will be asked to complete an anonymous electronic survey to evaluate your knowledge, perceptions, and clinical practices related to QT/QTc risk assessment.

**RISKS AND/OR DISCOMFORTS**
There are no foreseeable risks with you for participating in this project.

**BENEFITS**
The following benefits may be associated with your participation in this project: Participants will gain increased knowledge of QT/QTc prolongation risk in patients on psychotropic medications.

**ALTERNATIVES**
There are no known alternatives available to you other than not taking part in this project. However, if you like to receive the educational material given to the participants in this project, it will be provided to you at no cost.

**CONFIDENTIALITY**
The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report, we might publish, we will not include any information that will

make it possible to identify you as a participant. Records will be stored securely, and only the project team will have access to the records.

**COMPENSATION & COSTS**
There is no cost or payment to you for receiving the health education and/or participating in this project.

**RIGHT TO DECLINE OR WITHDRAW**
Your participation in this project is voluntary. You are free to participate in the project or withdraw your consent at any time during the project. Your withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove you without your consent at such time that they feel it is in the best interest.

**RESEARCHER CONTACT INFORMATION**
If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Dr. Antonella Grana at 305-348-7748, agrana@fiu.edu.

**IRB CONTACT INFORMATION**
If you would like to talk with someone about your rights of being a subject in this project or about ethical issues with this project, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

**PARTICIPANT AGREEMENT**
I have read the information in this consent form and agree to participate in this project. I have had a chance to ask any questions I have about this project, and they have been answered for me. I understand that I will be given a copy of this form for my records.

_____ _____
Signature of Participant Date

_____
Printed Name of Participant

_____ _____
Signature of Person Obtaining Consent Date

## Appendix F: Florida International University Institutional Review Board Approval Letter

FIU | FLORIDA INTERNATIONAL UNIVERSITY

**Office of Research Integrity**
**Research Compliance, MARC 430**

# MEMORANDUM

| | |
|---|---|
| **To:** | Dr. Antonella Grana |
| **CC:** | Alexis Williams |
| **From:** | Kourtney Wilson, MS, IRB Coordinator KMW |
| **Date:** | February 11, 2025 |
| **Protocol Title:** | "Implementing a QTc Prolongation Risk Assessment Template for ECG Monitoring in Patients on Psychotropic Medications: A Quality Improvement Project" |

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

**IRB Protocol Exemption #:** IRB-25-0034 **IRB Exemption Date:** 02/11/25
**TOPAZ Reference #:** 115262

As a requirement of IRB Exemption you are required to:

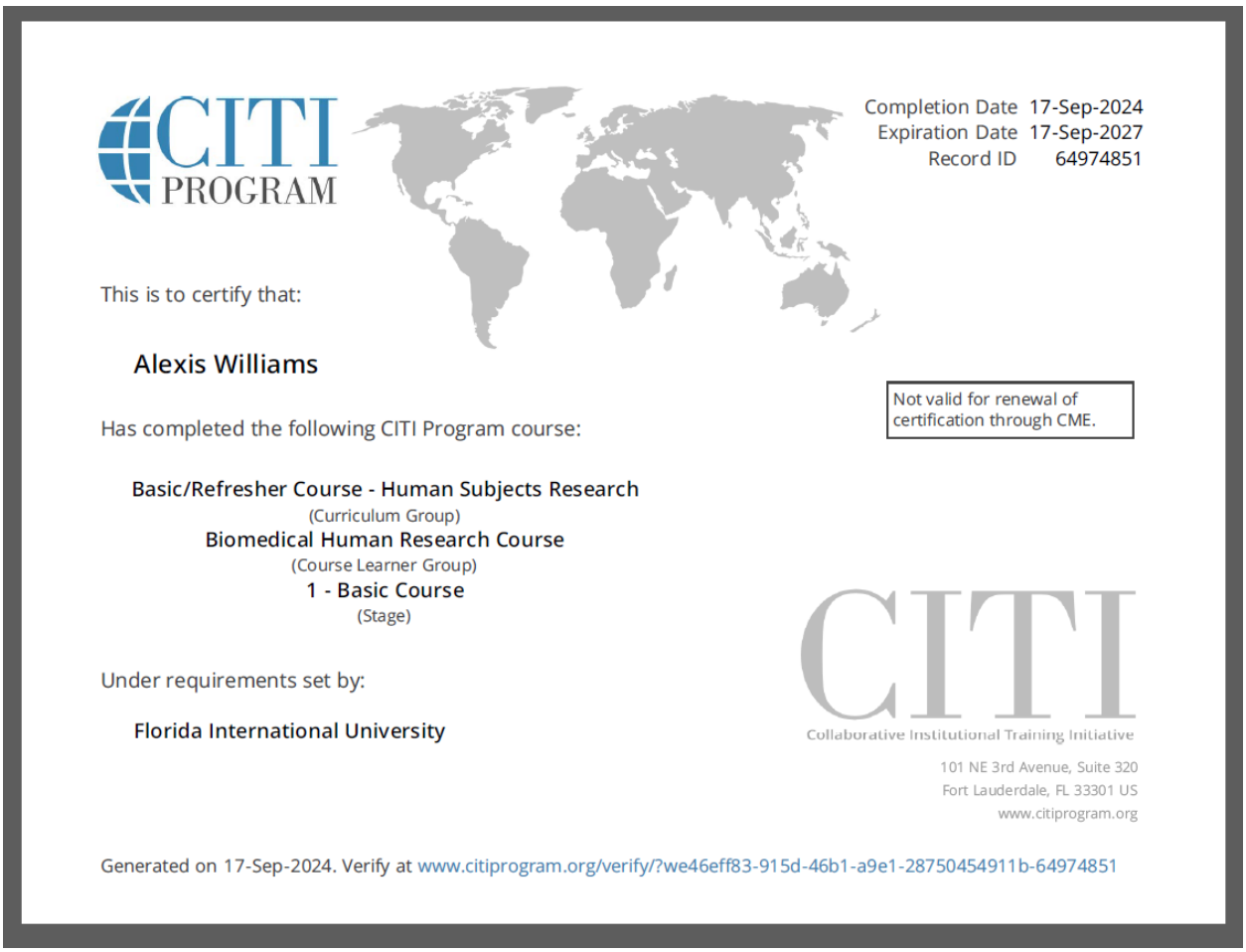
1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

***Special Conditions:*** **N/A**

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

KMW

## Appendix G: Florida International University CITI Ethics Certification



CITI PROGRAM

Completion Date 17-Sep-2024
Expiration Date 17-Sep-2027
Record ID 64974851

This is to certify that:

Alexis Williams

Not valid for renewal of certification through CME.

Has completed the following CITI Program course:

Basic/Refresher Course - Human Subjects Research
(Curriculum Group)
Biomedical Human Research Course
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Florida International University

CITI
Collaborative Institutional Training Initiative

101 NE 3rd Avenue, Suite 320
Fort Lauderdale, FL 33301 US
www.citiprogram.org

Generated on 17-Sep-2024. Verify at www.citiprogram.org/verify/?we46eff83-915d-46b1-a9e1-28750454911b-64974851

## Appendix H: Post-Presentation Survey

FIU | FLORIDA INTERNATIONAL UNIVERSITY

**INTRODUCTION**

The primary objective of this quality improvement project is to evaluate the effectiveness of a QTc prolongation risk assessment template in enhancing systematic ECG monitoring and clinical adherence among psychiatric providers prescribing psychotropic medications.

The ultimate goal is to enhance patient safety by reducing the risk of adverse cardiac events, such as torsade de pointes and sudden cardiac death, through improved monitoring and documentation practices. By addressing gaps in knowledge and practice, this project seeks to advance the quality of psychiatric care and establish best practices for QTc prolongation risk management in patients on psychotropic medications.

Please answer the questions below to the best of your ability. The questions are in multiple-choice format. They are meant to measure knowledge and perceptions on the identification and management of QTc prolongation risk.

**SURVEY**

1.) How useful was the content of this presentation for your practice or other professional development? Use the scale from extremely useful to not useful.

A. Extremely useful

B. Very useful

C. Somewhat useful

D. Not so useful

E. Not at all useful

2.) I would rate my likelihood to assess the risk-benefit ratio of psychiatric medications and QTc prolongation PRIOR to attending this presentation as:

A. Excellent

B. Very Good

C. Good

D. Fair

E. Poor

3.) I would rate my likelihood to assess the risk-benefit ratio of psychiatric medications and QTc prolongation AFTER attending this presentation as:

A. Excellent

B. Very Good

C. Good

D. Fair

E. Poor

4.) Based upon your participation in this presentation, do you plan to utilize the Tisdale QT Risk Assessment Tool Template in TherapyNotes? (Choose only one of the following options.)

A. I do plan to implement the tool into my practice based on the information presented

B. My current practice has been reinforced by the information presented

C. I need more information before I will change my practice

D. I do not plan to implement the tool in my practice

5.) Which of the following do you anticipate will be the primary barrier to implementing these changes?

A. Time constraints

B. lack of interprofessional team support

C. System constraints

D. Treatment-related adverse events

E. Patient adherence/compliance

F. Other

## Appendix I: Letter of Support from Facility

RFS PSYCHIATRY

412 E Madison St Suite 1012
Tampa, FL 33602
Phone: (813) 364-4465
Fax: (813)322-5544

January 18th, 2024

Dr. Antonella Grana, DNP, PMHNP-BC
Clinical Associate Professor
Nicole Wertheim College of Nursing & Health Sciences
Florida International University

Dear Dr. Grana,

I am writing this letter in support of the IRB application submitted by Alexis Williams for her DNP project at RFS Psychiatry. I understand that this project will involve providing an educational presentation on QT/QTc prolongation risk factors, introducing a QTc prolongation risk assessment template, and administering an anonymous electronic survey to psychiatric providers at our site. These activities are aimed at improving systematic ECG monitoring and clinical adherence for patients prescribed psychotropic medications.

I fully support this research project being conducted at RFS Psychiatry and confirm our willingness to cooperate with all study procedures outlined in Ms. Williams's proposal. Please do not hesitate to contact me if there are any questions regarding our partnership on this project.

Sincerely,

Signed by:
Dr. Craig Jorden
519AD4D0F4C4DD...

Dr. Craig Jorden Jr, DNP, PMHNP-BC
USAF, Captain
CEO | RFS Psychiatry
813-364-4465
recoveryfromsocietyinc@gmail.com
www.recoveryfromsociety.com

## Appendix J: Literature Matrixes

Summary of Primary Research Studies

| **Author/Year** | **Purpose/ Problem/ Objective/ Aims** | **Study Design** | **Sample (Setting)** | **Data Collection Measures** | **Results** | **Strengths/ Limitations** | **Relationship to Project** | **Level of Evidence** |
|---|---|---|---|---|---|---|---|---|
| Tisdale et al. (2013) | The study aimed to develop and validate a clinical risk score to predict QT interval prolongation in hospitalized patients. This | A prospective observational study was conducted in two cardiac care units | 900 patients in the derivation group (DG) and 300 patients in the validation group (VG) were consecutively admitted to the | Data was collected on patient demographics, medical history, laboratory values, and medications. QT interval | Independent predictors of QTc prolongation included: Female sex Myocardial infarction Sepsis | **Strengths**: Comprehensive analysis of multiple risk factors High applicability to clinical settings for | This study's valid and reliable tool can be used to guide risk assessment in clinical | Level II |

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| | score may lead to interventions aimed at reducing the risk of torsades de pointes (TdP). | at a tertiary care institution. | cardiac care units at Indiana University Health Methodist Hospital, Indianapolis | measurements were taken using ECG and telemetry monitoring. QT interval prolongation was defined as a QTc interval greater than 500 ms or an increase of more than 60 ms from baseline. | Left ventricular dysfunction Administration of QT-prolonging drugs (≥ 2 drugs increased risk further) Loop diuretic use Age > 68 years | risk stratification High specificity and sensitivity in predicting QTc prolongation The study proved the tool's validity and reliability **Limitations:** Conducted in a single | settings for identifying patients at high risk of QTc prolongation, thereby contributing to improved patient monitoring and the | |

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| | | | | | Serum potassium < 3.5 mEq/L Admission QTc > 450 ms The risk score stratified patients into low-, moderate-, and high-risk categories, with QTc prolongation occurring in 15% (low), | inpatient institution, limiting generalizability No direct evaluation of torsades de pointes occurrence Serum magnesium levels were not consistently measured, | prevention of drug-induced TdP. | |

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| | | | | | 37% (moderate), and 73% (high) of the validation group. | which is a potential risk factor for QT prolongation. | | |
| Shao, W., Ayub, S., Drutel, R., Heise, W.C., & Gerkin, R. (2019) | The study aimed to assess the impact of psychiatric medications and concomitant risk factors on the prevalence of QTc prolongation | Retrospective cross-sectional study. | The study included 517 adult inpatients from a university medical center behavioral health unit who received psychiatric | The study collected baseline and follow-up ECGs, psychiatric and non-psychiatric medications taken, and | 16.8% of subjects had borderline QTc prolongation (greater than 450 ms for males and 470 ms for females), and | **Strengths:** The study utilized a validated risk score system (Mayo Clinic Pro-QTc) and provided a clear protocol for ECG | This study provides a framework for assessing the risk of QTc prolongation in patients | Level IV |

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| | and torsades de pointes (TdP) in hospitalized patients. Additionally, the study aimed to validate the use of the Mayo Clinic Pro-QTc Risk Score for predicting QTc prolongation and propose an evidence-based ECG monitoring | | medications with a risk of QT prolongation. Over a one-year period, 1,249 electrocardiograms (ECGs) were reviewed. | other associated risk factors such as age, diabetes, hypokalemia, overdose, and use of medications like haloperidol and diphenhydramine. Risk scores were assigned | 2.3% had QTc greater than 500 ms or an increase of more than 60 ms from baseline. No cases of TdP were observed. Independent predictors of QTc prolongation included age, diabetes, | monitoring based on risk stratification. It also encompassed a wide range of psychiatric medications and risk factors, making the findings applicable to a diverse patient population. | taking psychiatric medications. It supports the development of protocols for ECG monitoring based on patient risk factors | |

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| | protocol for psychiatric medication use. | | | based on individual patient and medication risks using the Mayo Clinic Pro-QTc Risk Score and the CredibleMeds classification system. | hypokalemia, overdose, diphenhydramine, and haloperidol. Female sex was found to be a protective factor. Risk scores were significantly associated with QTc prolongation, | **Limitations:** The study's retrospective nature limited the ability to establish cause-effect relationships. The study had a relatively small sample size, and polypharmacy was common, making it | and medication profiles. It is relevant to projects focused on reducing the cardiac risks associated with psychiatri | |

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| | | | | | with higher risk scores correlating with a higher incidence of QTc prolongation. | difficult to isolate the effects of individual medications on QTc prolongation. | c drug therapies. | |
| Poncet, et al, (2015) | To estimate the cost-effectiveness of electrocardiographic (ECG) screening for detecting prolonged QT (LQT) intervals | Cost-effectiveness analysis using a decision-analytic model based on a | The model was based on data derived from an in-hospital cross-sectional study at the Public Psychiatric Hospital of | Probabilities of long QT syndrome (LQTS), torsades de pointes (TdP), and sudden cardiac death (SCD) were | Screening 1,128 patients would avoid one TdP, and screening 2,817 patients would prevent one SCD. | **Strengths:** The study uses robust data from previous cross-sectional studies and expert | This study supports the cost-effectiveness of systematic ECG screening in | Level III |

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| | to reduce sudden cardiac death (SCD) in psychiatric inpatients. | decision tree structure. | Geneva involving a cohort of 6,790 psychiatric inpatients (mean age: 41 years). | derived from an in-hospital cross-sectional study and expert elicitation. Costs were estimated based on standard ECG procedures, LQT management, and TdP management. | The ICER for ECG screening was $8,644 per QALY gained, which is below standard cost-effectiveness thresholds ($50,000 to $100,000 per QALY). The probability of cost- | elicitation. The analysis was comprehensive, covering multiple sensitivity scenarios and probabilistic simulations. **Limitations:** The model relies heavily on expert estimates, and the | psychiatric patients to prevent SCD, especially in those at risk for drug-induced LQT. It provides valuable data for assessing the feasibility | |

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| | | | | The study assessed outcomes, including quality-adjusted life years (QALY), incremental cost-effectiveness ratios (ICER), and cost-effectiveness acceptability | effectiveness was 96% at a willingness-to-pay threshold of $50,000 per QALY. Sensitivity analyses showed that the ICER was sensitive to changes in TdP-related mortality and TdP reduction | interpretation of ECG results across clinical settings varies. Additionally, the study's retrospective design limits its generalizability. | of routine ECG monitoring in psychiatric care settings. | |

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| | | | | curves (CEAC). | following LQT detection. | | | |
| Berling, I., Gupta, R., Bjorksten, C., Prior, F., Whyte, I. M., & Berry, S. (2017) | The study aimed to evaluate the use of electrocardiograms (ECGs) to assess QT interval prolongation in a public psychiatric inpatient setting. This is | Retrospective observational study | 263 mental health inpatient admissions at a public emergency psychiatric inpatient unit between January 1, 2016, and February 11, 2016 | ECG availability during admission Manual measurement of the QT interval for risk assessment using the QT nomogram | Of the 263 patients, 50 (19%) had an ECG performed during admission. Of those with ECGs, 4 (8%) had prolonged QT intervals. Twelve of the 50 patients | **Strengths:** The study highlights the underutilization of ECGs in psychiatric settings, particularly among high-risk populations, and emphasizes | The study underscores the importance of systematic ECG screening in psychiatric settings, especially for | Level IV |

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| | relevant due to the increased rate of sudden cardiac death (SCD) associated with QT-prolonging medications, particularly antipsychotics, in psychiatric patients. | | | Demographic information and medication use, with a focus on medications known to prolong the QT interval | (24%) were on medications with known QT-prolonging risks. 3 out of these 12 patients (25%) had clinically significant QT prolongation on their ECGs. | the clinical relevance of accurate QT interval measurement using manual methods. **Limitations:** The study was retrospective, which limited its ability to establish causality. A bias existed in | patients on QT-prolonging medications. This directly informs practices aimed at reducing sudden cardiac deaths in psychiatric | |

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| | | | | | One patient experienced a cardiac event and died without an ECG being performed during the admission. | ECG ordering, favoring patients perceived as having higher risks. Additionally, no clear clinical recommendations were provided on managing patients with | populations through better risk assessment. | |

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| | | | | | | prolonged QT intervals. | | |

Summary of Systematic Reviews and Meta-Analyses

| **Author/Year** | **Title** | **Number of Studies** | **Study Design** | **Population** | **Key Findings/Applicability to Project** | **Level of Evidence** |
|---|---|---|---|---|---|---|
| Shah, A., Aftab, A., & Coverdale, J. (2014) | QTc Prolongation with Antipsychotics: Is Routine ECG Monitoring Recommended? | The review included an unspecified number of studies identified (the study did not use a PRISMA Flow Diagram) through a literature search | This literature review synthesizes data from a range of studies that assessed QTc prolongation, torsades de pointes (TdP), | The review focused on patients being treated with antipsychotic medications, both typical and atypical, across various clinical | QTc prolongation is a known side effect of both conventional and atypical antipsychotics, with the highest risks associated with drugs like thioridazine, haloperidol, and ziprasidone. | Level IV |

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| | | using PubMed and Embase, focusing on QTc prolongation and its relationship with the use of antipsychotics. | and sudden death associated with antipsychotic use. The reviewed studies varied in design but included clinical trials, observational studies, and case reports. | settings (inpatient, outpatient, and consultation liaison). Special attention was given to populations with coexisting cardiac risk factors and those at risk for TdP. | The risk of torsades de pointes (TdP) and sudden death increases with QTc prolongation, particularly when QTc exceeds 500 ms or rises by more than 60 ms from baseline. The review suggests that routine ECG monitoring may not be necessary for all patients on antipsychotics but is recommended for those with cardiac risk factors or when prescribing high-risk antipsychotics. | |

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| | | | | | ECG should be prioritized if the patient has a personal or family history of cardiac issues, electrolyte disturbances or is taking multiple QT-prolonging drugs. Recommendations include selective ECG monitoring based on individual risk factors, as routine monitoring may not be feasible in all settings. This review offers valuable guidelines for | |

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| | | | | | risk stratification and supports the use of tailored ECG monitoring rather than blanket monitoring in high-risk individuals. | |
| Arunachalam, K., Lakshmanan, S., Maan, A., Kumar, N., & Dominic, P. (2018) | Impact of Drug-Induced Long QT Syndrome: A Systematic Review | Thirty-six studies satisfied the inclusion criteria. | The systematic review adhered to PRISMA guidelines, encompassing cross-sectional studies, prospective observational studies, | There were 14,756 patients exposed to QT-prolonging drugs, with an average age of 43.8. The sample included both male and female patients | 6.3% of patients developed QTc prolongation, while 0.33% experienced torsades de pointes (TdP), and 2.6% developed ventricular arrhythmias. Drugs like methadone, antipsychotics (haloperidol, risperidone, | Level I |

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| | | | retrospective studies, and randomized controlled trials. | from various geographic locations, with the majority of studies conducted in the U.S. and Europe. | aripiprazole), and cardiac drugs (amiodarone, sotalol, dofetilide) were associated with the highest risks of QTc prolongation and ventricular arrhythmias. The review highlighted the increased risk of TdP with the use of multiple QT-prolonging drugs, particularly in schizophrenia patients treated with antipsychotics. | |

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| | | | | | The findings support the importance of cautious use of QT-prolonging drugs, particularly when multiple such drugs are combined.<br>This review is particularly relevant to projects focusing on the cardiac safety of drug therapies, especially in patients at risk of QTc prolongation. | |

Summary of Expert Consensus and Professional Organizational Statements

| **Author/Year** | **Title** | **Population** | **Key Findings/Applicability to Project** | **Level of Evidence** |
|---|---|---|---|---|
| Margo C. Funk, M.D., et al. (2018) | APA Resource Document on QTc Prolongation and Psychotropic Medications | Patients taking psychotropic medications, with a focus on those at risk for QTc prolongation and torsades de pointes (TdP), including adults in psychiatric care, ICU settings, and those with pre-existing cardiac conditions or on medications that affect QTc interval. | Psychotropic medications such as antipsychotics and antidepressants can prolong the QTc interval, increasing the risk of TdP. However, there is no absolute QTc interval at which these medications should not be used. Risk-benefit analysis is essential when prescribing QTc-prolonging psychotropic drugs, especially in patients with pre-existing cardiac conditions or other risk factors for TdP (e.g., electrolyte disturbances, concurrent QTc-prolonging medications). | Level V |

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| | | | Routine ECG monitoring is not required for all patients but should be considered in high-risk populations (e.g., those with cardiac comorbidities or those on multiple QTc-prolonging drugs).<br>The document emphasizes the importance of individualized patient care, particularly in resource-constrained settings, and provides guidelines on when to consult cardiology.<br>Co-administration of two or more QTc-prolonging medications and specific drug interactions significantly increases the risk of QTc prolongation. | |
| Glen L. Xiong, M.D., et al. (2020) | QTc Monitoring in Adults with Medical and | Adults with medical and psychiatric comorbidities are at | QTc prolongation is a risk associated with several psychotropic medications, | Level V |

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| | Psychiatric Comorbidities: Expert Consensus from the Association of Medicine and Psychiatry | risk for QTc prolongation, especially those receiving psychotropic medications that may increase the risk of torsades de pointes (TdP) and sudden cardiac death (SCD). | especially in patients with existing medical conditions like cardiovascular disease, electrolyte abnormalities, or those on multiple QTc-prolonging agents.<br>The expert consensus provides a risk score system to guide when ECG monitoring should be initiated for patients taking QTc-prolonging medications.<br>A baseline ECG is recommended for individuals with two or more risk factors (e.g., age over 65, female sex, heart disease, electrolyte imbalances, or use of multiple QTc-prolonging drugs). | |

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| | | | Psychotropic medications differ in their propensity to cause QTc prolongation, and ECG monitoring is suggested to be selective based on the individual medication's risk.<br>The consensus also stresses the importance of balancing the psychiatric benefits of medication against the risks of QTc prolongation and recommends tailoring ECG monitoring based on individual risk factors. | |