Analyzing Drug Interactions with Risk of QT Prolongation and the Utility of the Tisdale Scoring System

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BACKGROUND

- QT prolongation, which can be caused by various drug interactions, can increase the length of time a patient is hospitalized and causes increased all-cause mortality in patients.[1]
- Electronic health record programs alert physicians and pharmacists about these drug interactions frequently, which contributes to alert fatigue. Alert fatigue has been associated with serious events and even patient deaths.[2]
- By analyzing the effectiveness of the Tisdale Scoring system for QT prolongation, alerts could be streamlined.
- This scale considers the patient's age, sex, potassium level, QT, reason for admission, and concurrent medications.[3]

PURPOSE

- To further evaluate how QT prolongation correlates with the Tisdale scoring system.

METHODS

Study Design
- Retrospective chart review
- IRB was approved at the study site

Inclusion Criteria
- Age 18 years old or older
- Admitted to Springfield Memorial Hospital between 1/1/20 and 1/1/22
- Received two or more of the following medications: amiodarone, ondansetron, tramadol, haloperidol, hydroxyzine, citalopram, or fluconazole

Exclusion Criteria
- QT prolongation prior to receiving interacting medications
- Hospitalized for less than 48 hours
- Patients in hospice/end of life care

Study Measures
- **Primary Endpoint:**
  - How each patient's Tisdale Score correlated with their QT prolongation status
- **Secondary Endpoints:**
  - Whether an echocardiogram (EKG) was performed
  - Whether QT prolongation occurred
  - What drug interactions were associated with the most QT prolongation

METHODS

Data Analysis
- Descriptive statistics
- Statistical significance determined using Pearson Chi-square test

RESULTS

Table 1 Baseline Characteristics

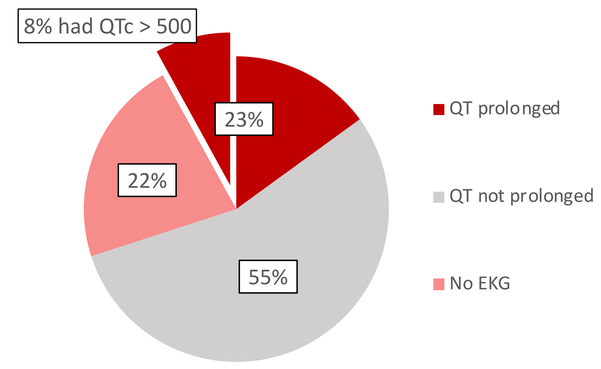
	Average (range) or N (%)	% QT prolonged
Age	54.5 years (18-97)	23%
White/Caucasian Race	140 (89%)	24%
Male Sex	92 (59%)	27%
Admitted for heart failure, myocardial infarction, or sepsis	34 (22%)	47%
Average # QT prolonging drugs	3 (2-6)	N/A

Table 2 Tisdale Score and QT Prolongation Status

Tisdale Risk Score	N (%)	# QT prolonged (%)
Low	20 (16%)	0 (0%)
Moderate	73 (59%)	19 (26%)
High*	30 (24%)	18 (60%)

* Signifies statistically significant difference between high and moderate risk groups (≤ 0.05)

Figure 3 Incidence of QT prolongation (N = 157)



RESULTS

Table 4 EKG Status

	N (%)
No EKG	34 (22%)
One EKG	56 (36%)
Multiple EKGs	67 (42%)

Table 5 Interactions with the Most QT Prolongation

Interaction	# receiving this combination (%)	# QT prolonged (%)
Amiodarone-furosemide	48 (31%)	25 (52%)
Amiodarone-tramadol	27 (17%)	15 (55%)
Amiodarone-ondansetron	26 (16.5%)	12 (46%)

LIMITATIONS

- Retrospective, single-institution, small sample size design
- Not all patients had an admission or follow up EKG meaning % QT prolonged could be falsely low
- Cannot guarantee the follow up EKG was obtained 5 half-lives after the drug was initiated
- Most patients were on multiple QT prolonging drugs, making it hard to pinpoint one specific causative drug-drug interaction

CONCLUSIONS

- The Tisdale score appropriately identified patients with a low risk of QT prolongation. There is a statistically significant difference between the high compared to moderate risk groups.
- Approximately twenty percent of our patient population is being under-monitored, which increases the risk of having unrecognized QT prolongation.
- Many patients only had one EKG during their hospitalization and could have developed undocumented QT prolongation.
- Alerts are still appropriate for patients in the moderate and high-risk categories, leaving the decision to the practitioner's clinical judgment.

References
1. Li M, Ramos LG. Drug-Induced QT Prolongation and Torsades de Pointes. *P T*. 2017;42(7):473-477.
2. Johnson KR, Hagadorn JI, Sink DW. Alarm Safety and Alarm Fatigue. *Clin Perinatol*. 2017;44(3):713-728.
3. Tisdale, J. E., et al. Development and validation of a risk score to predict QT interval prolongation in hospitalized patients. Circ Cardiovasc Qual. 2013;6(4):479-487.