

# Evaluation of QTc Interval in Children Receiving Multiple Medications



Shalini Singla, B.Sc.(Pharm); Roxane Carr B.Sc.(Pharm), ACPR, PharmD, BCPS, FCSHP; Jennifer Kendrick B.Sc.(Pharm), ACPR, PharmD

## Background

- Many medications that are commonly used in children, such as antifungals, antiemetics and macrolide antibiotics can cause QTc prolongation
- QTc prolongation can lead to Torsades de Pointes (TdP) which can be life-threatening
- Currently, there is a lack of consensus regarding effective monitoring and management of pediatric patients receiving QTc prolonging medications
- Our goal is to describe the management of pediatric patients receiving multiple QTc prolonging medications at our site

## Outcomes

### Primary Outcome

- Changes to drug therapy associated with changes in QTc

### Secondary Outcomes

- Type and mean number of QTc prolonging medications received
- Proportion of patients with risk factors for QTc prolongation
- Other actions resulting from QTc prolongation:
  - Repeat ECG, correction of modifiable risk factors

## Methods

### Retrospective cohort study

- List of patients on 2 or more QTc prolonging medications was screened for patients who also had an ECG performed during the same visit
- Collected in reverse chronological order
- Sample size of convenience (75 patients)

### Inclusion Criteria

- Pediatric patients (0-19 years old) admitted to BCCH between August 2010 and August 2017
- Receiving more than one QTc prolonging medication
- Had at least one ECG during their admission

Prolonged QTc defined as >460 ms as calculated electronically by the ECG monitor using the Bazett formula.

QTc prolonging medications of interest are those known to cause QTc prolongation or carry a risk of TdP according to the AZCERT list.

## Results

Table 1. Patient Characteristics

Characteristic	All (n=80)	Prolonged QTc (n=48)	Normal QTc (n=32)
Female n (%)	39 (49)	25 (52)	14 (44)
Age, median (IQR), years	5 (2-12)	4 (1.7-8)	11 (3.8-14.3)
Length of stay, median (IQR), days	6 (15.3-19.3)	5 (4-9)	14 (5-31.5)
Admitting diagnosis n (%)			
Cardiology	47 (59)	37 (77)	10 (31)
Oncology	15 (19)	5 (10)	10 (31)
Infectious disease	11 (14)	4 (8)	7 (22)
General pediatrics	2 (3)	2 (4)	0
Cystic fibrosis	2 (3)	0	2 (6)
Neurology	2 (3)	0	2 (6)
General surgery	1 (1)	0	1 (3)
Known cardiac conditions n (%)	54 (68)	42 (88)	12 (38)
Potassium at ECG n (%)			
Hyperkalemia	6 (8)	5 (10)	1 (3)
Hypokalemia	10 (13)	6 (13)	4 (13)
Potassium within normal limits	38 (48)	18 (38)	20 (63)
No K <sup>+</sup> monitoring around ECG	26 (33)	19 (40)	7 (22)
Magnesium at ECG n (%)			
Hypermagnesemia	0	0	0
Hypomagnesemia	15 (19)	6 (13)	9 (28)
Magnesium within normal limits	12 (15)	7 (15)	5 (16)
No Mg <sup>2+</sup> monitoring around ECG	53 (66)	35 (73)	18 (56)
Bradycardia at ECG n (%)	6 (8)	4 (8)	2 (6)
Number of QTc prolonging medications, mean ±SD	2 ±0.6	2 ±0.5	2 ±0.8
Number of ECG per patient, mean ±SD	3 ±2.1	3 ±2.4	2 ±1.1
QTc value, mean ±SD, milliseconds	454 ±41.8	476 ±27.5	421 ±37.6

Figure 1. QTc Prolonging Medications Given

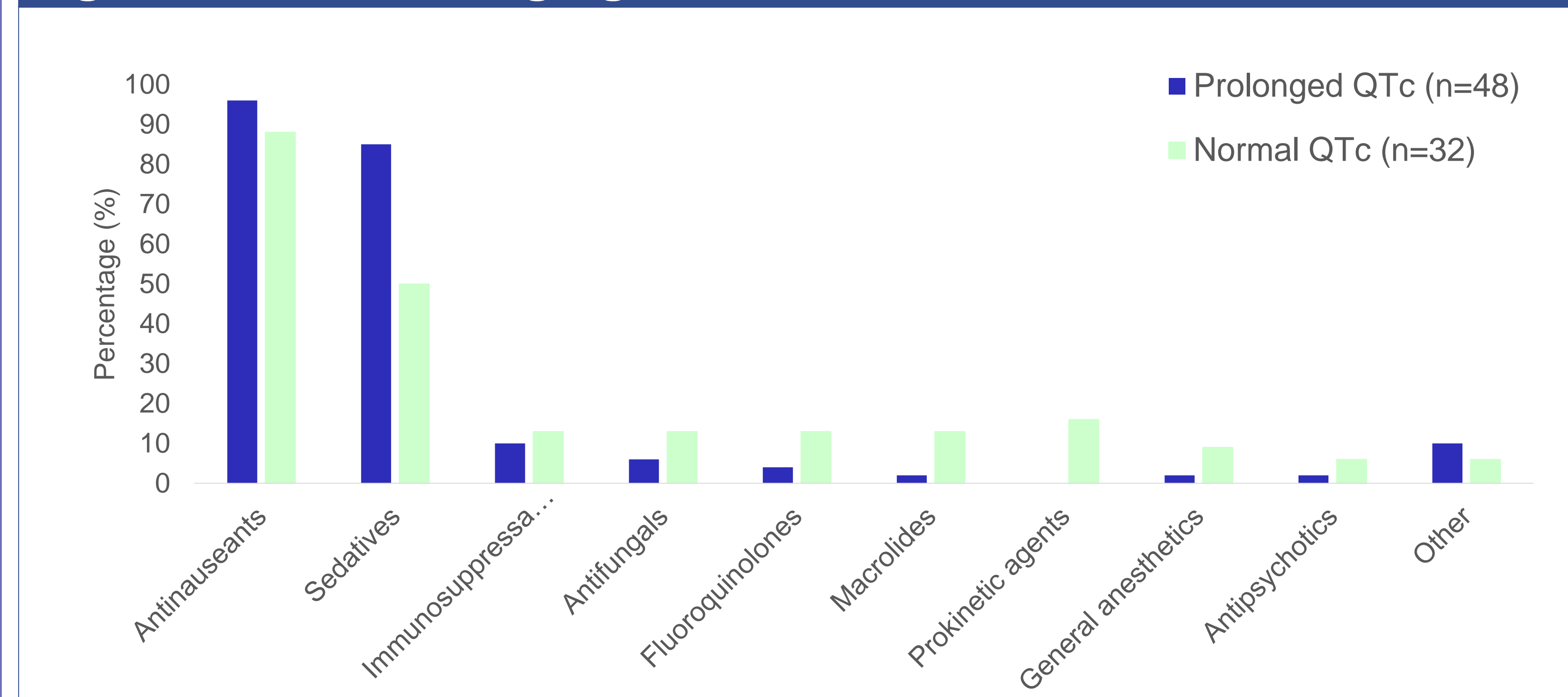
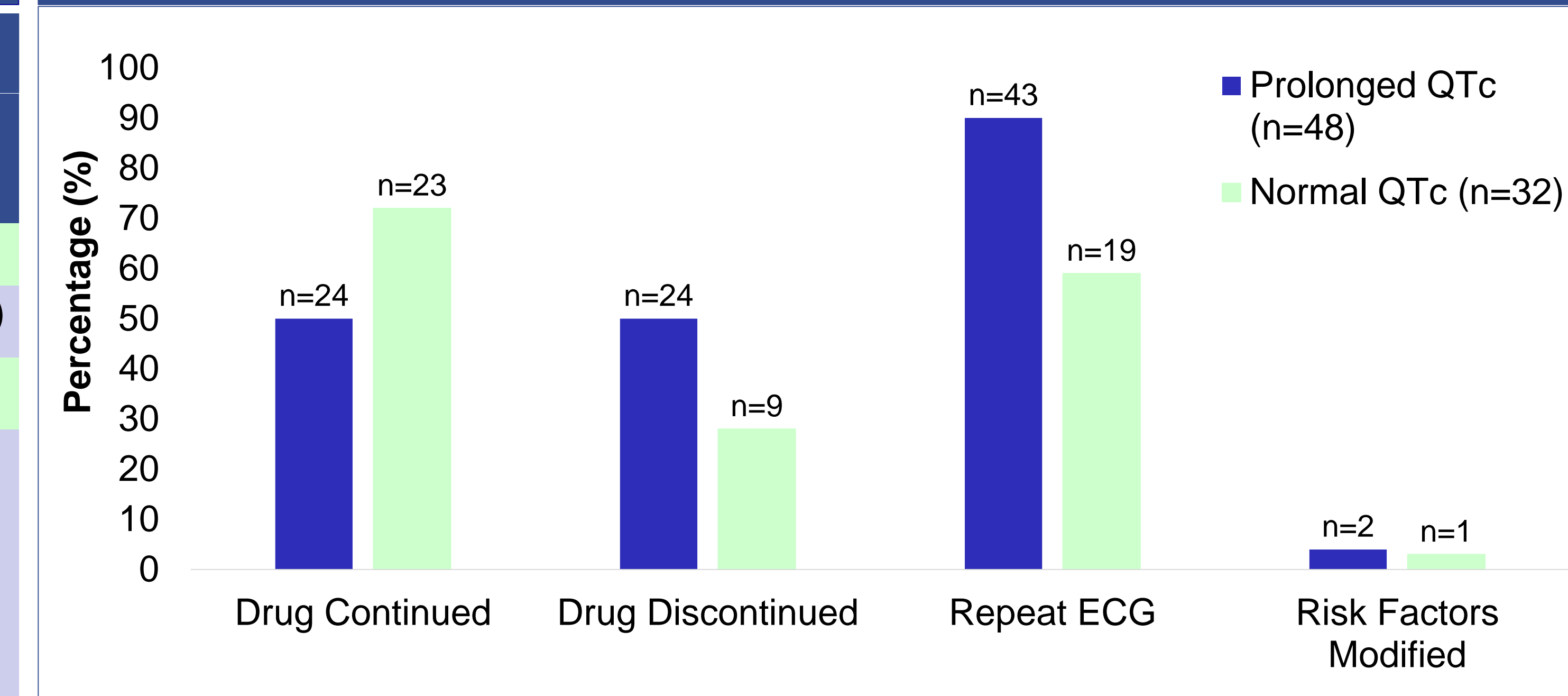
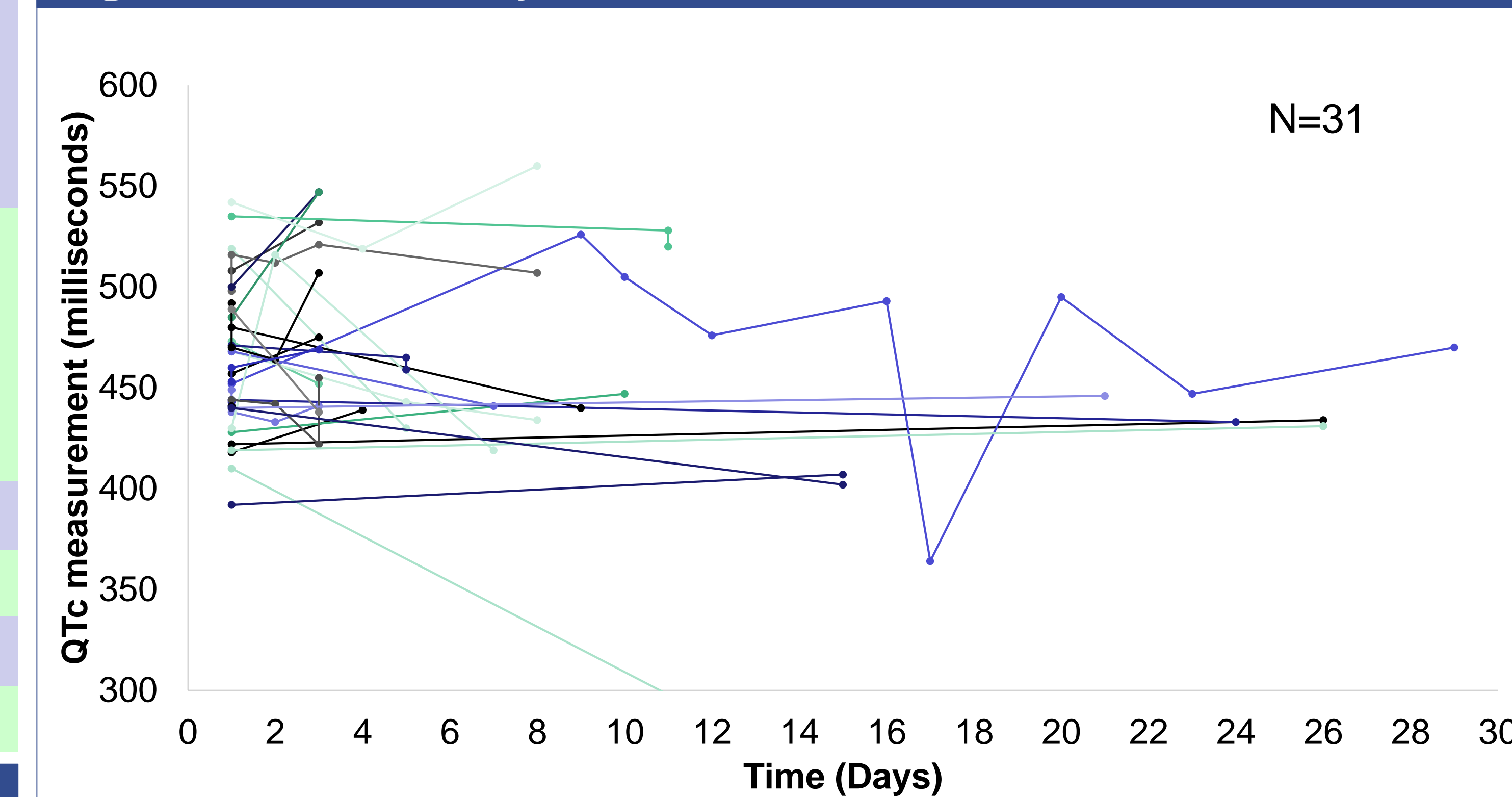


Figure 2. Actions As a Result of ECG



- 81% of patients (n=39) had a prolonged QTc on their first ECG
- 19% of patients (n=9) were given additional QTc prolonging medications post-abnormal ECG

Figure 3. Variability in QTc Measurements



## Limitations

- Single center retrospective design
- Bazett formula can overestimate QTc
- Definition of prolonged QTc is controversial
- Unclear to what extent a prescriber's decision regarding drug therapy and monitoring was influenced by the QTc measurement

## Conclusions

The presence of prolonged QTc does not appear to influence the prescriber's decision to either continue or discontinue medications associated with the risk of QTc prolongation. There is, however, more repeat ECG monitoring associated with prolonged QTc.