

# The Effect of QTc Prolongation on the Pharmacologic Management of Behavioral Emergencies



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## BACKGROUND

During behavioral emergencies, Consultation-Liaison (CL) psychiatrists frequently provide expert consultation on the use of psychotropic medication for agitation in patients who have complex cardiopulmonary disease, including prolonged QTc interval. Cardiopulmonary disease and prolonged QTc can increase the risk of potentially fatal ventricular arrhythmias, like torsades de pointes (TdP). CL Psychiatrists must weigh the risk of using psychotropic medications, which can further prolong QTc interval, versus inherent safety risks of allowing acute agitation to go untreated.

To assess the risk of QTc prolongation and TdP, the literature suggests relying on EKG parameters or correction methods not routinely available on automated EKG interpretations (Beach et al., 2018). For example, the Bazett formula, typically used on automatic EKG interpretations, may overestimate the QTc at higher heart rates. It also does not account for conditions that widen QRS but do not actually increase risk of TdP (Funk et al., 2021).

## PURPOSE & OBJECTIVES

1. To examine patterns of psychotropic medication recommendations, patterns of QTc prolongation, and whether QTc prolongation is associated with different psychotropic medication recommendations during behavioral emergencies.
2. To identify quality improvement (QI) targets for future service and program change.

## METHODS

This study involves secondary data analysis of existing clinical datasets combined with retrospective chart review of behavioral emergency response team activations (BERT) occurring from June 2023 to July 2024. The first 924 BERTs were reviewed to identify a cohort of 500 BERTs that included a pharmacologic intervention. The following variables were collected:

- 1) Patient Variables: age; sex; presence of delirium
- 2) EKG Variables: heart rate, rhythm, QRS, QT,
- 3) BERT Variables: BERT time/date; psychotropic medications (class & route)

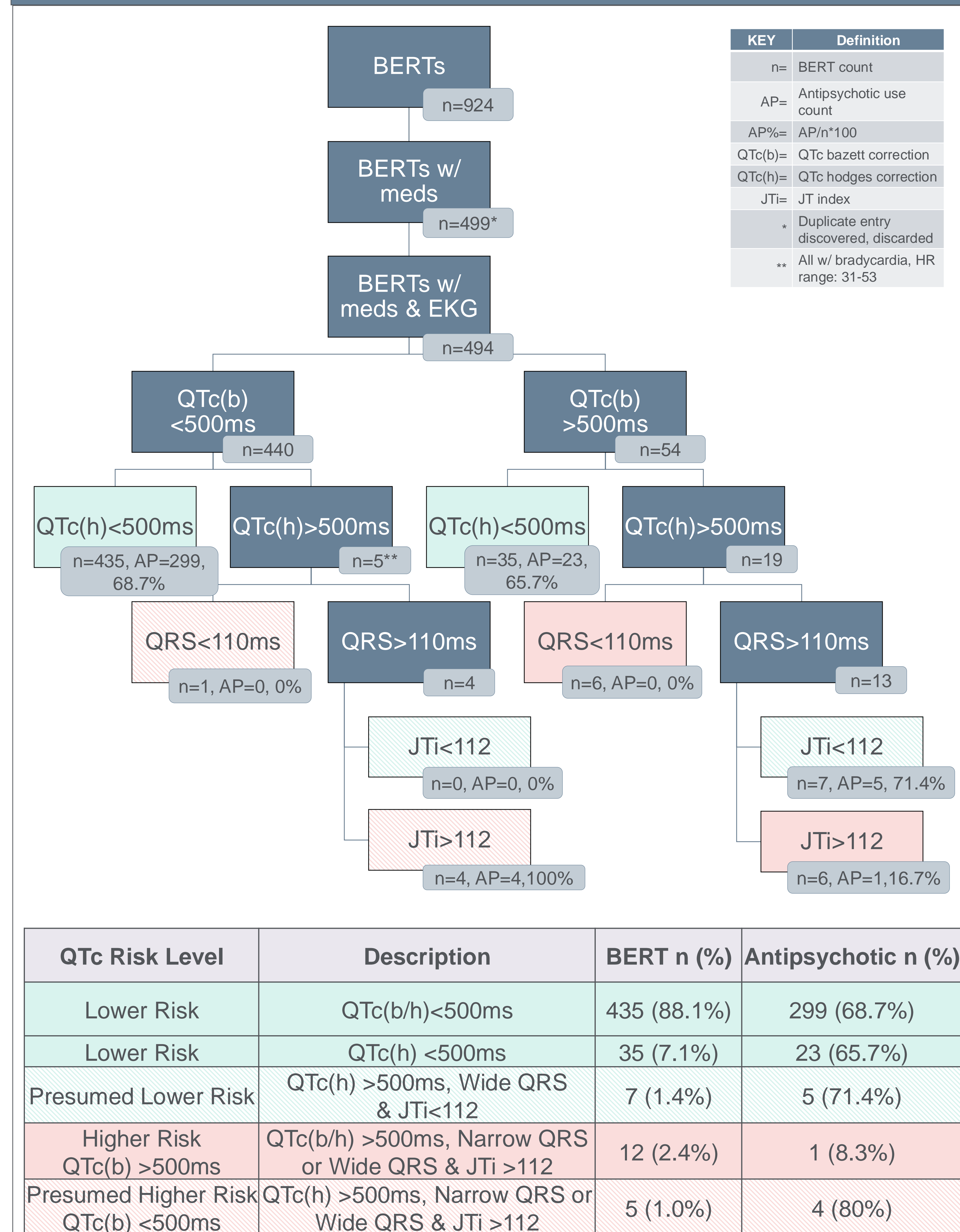
According to expert recommendations (Beach et al., 2018; Funk et al., 2021), we used an alternative QTc correction formula and adjusted for wide QRS, if present, to more accurately assess the risk of TdP. For each EKG, QTc was calculated using the Hodges correction method (QTc(h)) followed by a JT index (JT<sub>i</sub>) calculation to account for QRS >110ms. Based on these variables, we then created QTc Risk Levels for data analysis.

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>Adults ages 18-120</li> <li>Medical and surgical inpatients at the time of BERT</li> <li>BERT during 6/2023 – 7/2024</li> </ul>	<ul style="list-style-type: none"> <li>Outpatients</li> <li>Emergency department only encounters</li> <li>Psychiatric inpatients</li> <li>Children (ages &lt;18 years)</li> </ul>

TABLE 1: Selected BERT Sample Demographics

Category	All BERT Events, n = 924 BERTs		BERTs w/ meds, n = 499 BERTs		BERTs w/ meds & QTc(b) > 500msec, n = 59	
	Total BERT Count	Total %	Total BERT Count	Total %	Total BERT Count	Total %
<b>Total Cohort</b>	924	100.0%	499	100.0%	59	100%
<b>Female</b>	365	39.5%	216	43.3%	12	20%
<b>Age &gt; 60</b>	673	72.8%	405	81.2%	52	88%
<b>Delirium Contributing</b>	514	55.6%	344	68.9%	45	76%
<b>Antipsychotic Utilized</b>	323	35.0%	323	64.7%	23	39%

FIGURE 1: BERT Event Flowchart w/ EKG Parameters, % Antipsychotic Use, & Risk Level



## KEY RESULTS

1. Older age, male sex, and delirium are prevalent in BERT events, particularly when complicated by prolonged QTc.
2. 54% (499/924) of BERTs utilize medications for de-escalation.
3. Of BERTs utilizing meds, 11.8% (59/499) of BERTs are complicated by prolonged either QTc(b) or QTc(h).
4. Antipsychotics account for 64.6% of medications used in BERTs but only 39% for BERTs complicated by QTc prolongation.
5. When BERT events complicated by prolonged QTc are divided into risk levels, the percentage of antipsychotic use appears consistent amongst Lower and Presumed Lower Risk categories (65.7- 71.4%). This percentage drops precipitously (8.3%) for Higher Risk BERT events.
6. Notably, this analysis revealed n=5 patients, all with bradycardia, with QTc(b) <500ms but QTc(h) >500ms who are at a Presumed Higher risk for TdP but still received antipsychotics at high rates.

## CONCLUSION

- Medications and antipsychotic use during behavioral emergencies are common.
- Relying on QTc(b) may overestimate risk of TdP and unnecessarily reduce rates of antipsychotic use for management of behavioral emergencies.
- By using QTc(h) and a wide QRS correction method, we were able to identify additional patients at lower risk or presumed lower risk for TdP and use antipsychotics at similar rates to patients with QTc(b) <500ms.
- In the setting of bradycardia and a seemingly reassuring QTc(b) <500ms, use of QTc(h) may identify a cohort of patients at higher risk for TdP.

## REFERENCES

1. Beach SR, Celano CM, Sugrue AM, et al. QT Prolongation, Torsades de Pointes, and Psychotropic Medications: A 5-Year Update. *Psychosomatics*. 2018;59 (2):105-122.
2. Funk MC, Cates KW, Rajagopalan A, Lane CE, Lou J. Assessment of QTc and Risk of Torsades de Pointes in Ventricular Conduction Delay and Pacing: A Review of the Literature and Call to Action. *J Acad Consult Liaison Psychiatry*. 2021 Sep-Oct;62(5):501-510. doi: 10.1016/j.jaclp.2021.02.003. Epub 2021 Feb 13. PMID: 34489062.