

Predictive Validity of a QT Prolongation Risk Score in a Medical Intensive Care Unit



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Background

- Torsades de Pointes (TdP) is a form of polymorphic ventricular tachycardia associated with QT interval prolongation¹
- Previous studies have reported the prevalence of prolonged QT interval in critically ill patients to range from 24-61%²
- Currently, there are no tools that identify the risk of developing QT prolongation in medical intensive care unit patients
- The Tisdale et al. Risk Score was developed and validated in a cardiac critical care unit and is the only tool developed in a critically ill cohort³

Objectives

Primary:

- Evaluate the predictive validity of the Tisdale et al. Risk Score in the Surrey Memorial Hospital (SMH) Intensive Care Unit (ICU)

Secondary:

- Determine the incidence of QTc prolongation (>500ms or >60ms from baseline)
- Determine the incidence of TdP

Methods

Design: Retrospective cohort study

Inclusion: ≥18 years of age admitted to the SMH ICU between October 1, 2017 and July 31, 2018

Exclusion: Length of stay (LOS) <1 day or >14 days, readmissions during the study period, or factors that affect the accuracy of QTc interval measurement

Tisdale et al. Risk Score:

1 Point	2 Points	3 Points
≥ 68 years old	K ⁺ ≤ 3.5mEq/L	1 QTc – prolonging drug
Female	Admission QTc ≥ 450ms	≥ 2 QTc – prolonging drugs
Loop diuretic	Acute MI	Sepsis
		Heart failure

Risk Categories:

Low	Moderate	High
<7	7-10	≥11

Results

Table 1: Patient Characteristics

Characteristics	All N=264	QTc Prolongation n=91	No QTc Prolongation n=173
Age, yrs (SD)	59 (±16.5)	62 (±13.7)	58 (±17.7)
Female, n (%)	99 (38)	31 (34)	68 (39)
Admission diagnosis, n (%)			
Sepsis	59 (22)	21 (23)	38 (22)
Pneumonia	51 (19)	18 (20)	33 (19)
Cardiac arrest	25 (9)	10 (11)	15 (9)
APACHE II score (SD)	20 (±7.5)	20 (±6.9)	20 (±7.8)
Comorbidities, n (%)			
Chronic kidney disease	42 (16)	16 (18)	26 (15)
HFrEF	18 (7)	10 (11)	8 (5)
Baseline QTc interval, ms (SD)	447 (±27.3)	448 (±33.6)	446 (±23.5)
QT Prolonging drugs, n (%)			
Points for one drug	259 (98)	91 (100)	168 (97)
Points for ≥ 2 drugs*	225 (85)	87 (96)	138 (80)
Known risk drugs, n (%)			
Propofol*	187 (71)	75 (82)	112 (65)
Azithromycin	61 (23)	20 (22)	41 (24)
Amiodarone*	26 (10)	14 (15)	12 (7)
LOS, days (IQR)*	4.5 (2.9-7.4)	5.9 (3.8-9.1)	4.0 (2.4-5.7)
ICU mortality, n (%)	53 (20)	21 (23)	32 (18)

*P value <0.05 between the QTc Prolongation and No QTc Prolongation groups.

Table 2: Results in a 2x2 Table

Risk Category	QTc Prolongation, n	No QTc Prolongation, n	Total, N (%)
Moderate + High	88*†	145*†	233 (88)
Low	3	28	31 (12)
Total, N (%)	91 (34)	173 (66)	264

*Moderate: QTc Prolongation n = 41, No QTc Prolongation n = 78

†High: QTc Prolongation n = 47, No QTc Prolongation n = 67

Table 3: Predictive Validity of QT Prolongation Risk Score

Risk Category	Sensitivity % (95% CI)	Specificity % (95% CI)	Positive Likelihood Ratio (95% CI)	Negative Likelihood Ratio (95% CI)
Moderate + High	97 (91-99)	16 (11-23)	1.15 (1.07-1.24)	0.20 (0.06-0.65)
Moderate	93 (81-99)	26 (18-36)	1.27 (1.10-1.46)	0.26 (0.08-0.81)
High	94 (83-99)	29 (21-40)	1.33 (1.15-1.54)	0.20 (0.07-0.64)

Secondary Outcomes

- QT prolongation incidence was 9 cases per 100 person-days
- No patient developed TdP during the study period

Discussion

- The proportion of patients that developed QT prolongation in the SMH ICU is similar to the Tisdale et al. study³
- More SMH ICU patients were categorized as moderate and high risk compared to the Tisdale et al. study
 - This may have contributed to the poor specificity of the score
- Given the tool's high sensitivity in the SMH ICU, it may be reasonable to minimize the use of 12 lead ECG monitoring for QT prolongation in low risk patients

Limitations

- Single-centre, retrospective design
- Average LOS was longer compared to the original study
 - Scores were calculated once for each patient during their ICU stay
- QT prolongation is a surrogate marker, not a clinical outcome
- Sample size is too small to explore the relationship between QT prolongation and TdP

Conclusions

- The Tisdale et al. Risk Score showed high sensitivity in the SMH ICU, making it useful in ruling out QT prolongation in low risk patients
- Due to the tool's low specificity, it should not be used to rule in QT prolongation

References

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