QTc Prolongation and Prevention of Torsades de Pointes (TdP): ED and Inpatient

Definition

- Torsades de Pointes (TdP) is a ventricular tachycardia characterized by a twisting of the peaks of the QRS complex across the isoelectric line and is associated with a long QT or QTc.
- TdP is often associated with prolonged corrected QT intervals (QT_c).
  - For males, QTc > 470 ms is prolonged.
  - For females, QTc > 480 ms is prolonged while QTc > 500 ms is highly prolonged.
- QTc > 500 is associated with an increased risk of TdP.

Scope of Problem

- Torsades de Pointes is a rare but associated with a high mortality
- Greatest risk for development of TdP occurs when the patient exhibits multiple risk factors.
- In one study, an overwhelming proportion of patients (98%) who experienced QTc prolongation (> 550 ms) had a plausible reversible cause.
- In one study, QT-prolonging drugs and electrolyte disturbances contributed significantly to developing QT prolongation.
- Drug-related QTc prolongation is most common.
  - In one study, 51% of study population was exposed to a single agent and 17% of patients are exposed to ≥1 QTc prolonging medication during admission.
- Risk for TdP increases significantly with concurrent use of ≥1 QT prolonging drug.
- Meta-analysis of 23 studies on prolonged QT interval and mortality found consistent associations between prolonged QT interval length and increased risk of total, cardiovascular, coronary, and sudden cardiac mortality.

Risk Factors

- Older age
  - > 65 years
- Female
- Congestive heart failure (CHF)
- Coronary ischemia
- Bradycardia
- Electrolyte abnormalities
  - K+ < 3.0 mmol/L
  - iCa < 3.5 mg/dL
  - Mg < 1.4 mg/dL
- Genetic disposition to QT prolongation
  - Baseline QT prolongation or family history of syncope
  - Sudden death
  - Long QT syndrome

Use of other QT prolonging drugs

QTc Monitoring

Indications:

- Initiation of high risk medication known to cause TdP.
  - See Algorithm 1.
- Initiation of a moderate risk medication known to cause TdP and ≥2 risk factors.
  - See Algorithm 1.
- Overdose of proarrhythmic agent.
- New-onset bradyarrhythmia:
  - High grade heart block.
  - Severe symptomatic bradycardia.
- Severe hypokalemia or hypomagnesaemia.

Other considerations:

- Computer generated QTc may be unreliable and should be confirmed manually.
- Atrial fibrillation.
- Bundle branch block.
- Ventricular paced rhythm.
- Ventricular conduction abnormalities.
- Identification of the end of the T wave is unreliable.
- Prognosis – frequent QTc monitoring may not be indicated in patients with less than 1 year prognosis.

Methods:

- To ensure consistency and accuracy, utilize a 12-lead ECG to obtain QTc values.

Frequency:

- See Algorithm 1 for specific recommendations for monitoring.
- Duration of monitoring depends on:
  - Drug half-life.
  - Drug elimination.
  - Time it takes for QTc to return to pre-drug baseline.
  - Presence of any QT-related arrhythmias.

Additional ECG Abnormalities

- Other ECG abnormalities that often prelude TdP include:
  - Marked QT-U prolongation and distortion following a pause.
  - Onset of ventricular ectopy and couplets.
  - T-wave alternans.
  - Episodes of polymorphic ventricular tachycardia initiated by a short-long-short R-R cycle sequence (often PVC – pause – PVC).
Management

- Correction of electrolyte abnormalities.
- Discontinuation of any QTc prolonging agents.
- Consider EP consult:
  - Congenital QT prolongation.
  - Incidence of TdP.
  - Severe bradyarrhythmia or heart block.
  - Continuous QT prolongation after correcting the underlying problem and/or removing offending agents.

References


Quality Measures

- Incidence of TdP
- ECG monitoring compliance for patients receiving more than one dose of a high risk medication

Order Sets

- High Risk QTc Monitoring
- Moderate Risk QTc Monitoring

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Guideline Approved


Disclaimer: Clinical practice guidelines and algorithms at The Ohio State University Wexner Medical Center (OSUWMC) are standards that are intended to provide general guidance to clinicians. Patient choice and clinician judgment must remain central to the selection of diagnostic tests and therapy. OSUWMC’s guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.

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Algorithm 1: Indications and Recommendations for QTc Monitoring

**HIGH Risk Monitoring**
- Obtain baseline 12 lead ECG if no 12 lead ECG in previous 24 hrs.
- Monitor QTc every 12 hrs for 24 hrs, then daily for 48 hrs.
- Following any dose increase or significant drug interaction, monitor QTc daily for at least 48 hrs.
- Duration of monitoring depends on drug half-life, elimination, how long it takes for QTc to return to pre-drug baseline, or if any QT-related arrhythmias are present.
- Consider EP Consult.
- Reevaluate risk factors daily while patient is receiving a high risk medication.

**MODERATE Risk Monitoring**
- Obtain baseline 12 lead ECG if no 12 lead ECG in previous 24 hrs.
- If QTc > 470 ms in males or QTc > 480 ms in females, monitor QTc daily for at least 72 hrs.
- Following any dose increase or significant drug interaction, if QTc > 470 ms in males or QTc > 480 ms in females, monitor QTc monitor daily for 72 hrs.
- Duration and frequency of monitoring may be variable based on drug half-life, elimination, how long it takes for QTc to return to pre-drug baseline, or if any QT-related arrhythmias are present.
- Reevaluate risk factors daily while patient is receiving a moderate risk medication.

**NO QTc monitoring recommended.**

*Note: Most common medications at OSUWMC, refer for QT Drugs Lists at www.crediblemeds.org for complete list

**Other Considerations**

- See QTc Monitoring – Indications
- Other Considerations for evaluating QTc