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

Goal
Prevent Torsades de Pointes (TdP) by identifying patients at risk and using ECG to monitor QT intervals.

Key Points
- TdP is a rare but associated with a high mortality
- Greatest risk for development of TdP occurs when the patient exhibits multiple risk factors.
- Drug-related QTc prolongation is most common. These common QT prolonging medications include certain antibiotics, antidepressants, antipsychotics, and antiarrhythmic medications.
- To ensure consistency and accuracy, utilize a 12-lead ECG to obtain QTc values.
- The frequency of ECG monitoring depends on the patient risk factors and additions or changes in medications.

Definition
- 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 (QTc).
  - 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
- 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 QTc 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
<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>QTc Monitoring</th>
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<tbody>
<tr>
<td>Older age &gt; 65 years</td>
<td>Initiation of high risk medication known to cause TdP (See Algorithm 1)</td>
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<tr>
<td>Female</td>
<td>Initiation of a moderate risk medication known to cause TdP and ≥ 2 risk factors (See Algorithm 1)</td>
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<td>Congestive heart failure</td>
<td>New-onset bradyarrhythmia:</td>
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<td>Use of QT prolonging drugs</td>
<td>- High grade heart block.</td>
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<td>Coronary ischemia</td>
<td>- Severe symptomatic bradycardia.</td>
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<td>Bradycardia</td>
<td>- Severe hypokalemia or hypomagnesaemia.</td>
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<td>Electrolyte abnormalities</td>
<td>Other Considerations</td>
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<td>K+ &lt; 3.0 mmol/L</td>
<td>- Computer generated QTc may be unreliable and should be confirmed manually.</td>
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<td>iCa &lt; 3.5 mg/dL</td>
<td>- Atrial fibrillation.</td>
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<td>Mg &lt; 1.4 mg/dL</td>
<td>- Bundle branch block.</td>
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<td>Genetic disposition to QT prolongation:</td>
<td>- Ventricular paced rhythm.</td>
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<td>Baseline QT prolongation or family history of syncope</td>
<td>- Ventricular conduction abnormalities.</td>
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<td>Sudden death</td>
<td>- Identification of the end of the T wave is unreliable.</td>
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<td>Long QT syndrome</td>
<td>Methods</td>
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<td></td>
<td>To ensure consistency and accuracy, utilize a 12-lead ECG to obtain QTc values.</td>
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<td>Frequency</td>
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<td>Duration of monitoring depends on:</td>
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<td>- Drug half-life.</td>
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<td>- Drug elimination.</td>
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<td>- Time it takes for QTc to return to pre-drug baseline.</td>
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<td>- Presence of any QT-related arrhythmias.</td>
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<td>Other ECG Abnormalities</td>
<td>See Algorithm 1 for specific recommendations for monitoring.</td>
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</table>

Frequent QTc monitoring may not be indicated in patients with less than 1 year prognosis.

Management
- Correction of electrolyte abnormalities, targeting K > 4 mmol/L and Mg > 2 mg/dL.
- Discontinuation of any QTc prolonging agents, as clinically appropriate.
- 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.

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).
Algorithm 1. Indications and Recommendations for QTc Monitoring

Does the patient meet one of the following indications?
- Overdose of proarrhythmic agent
- New-onset bradyarrhythmia
- Severe hypokalemia (K+) or hypomagnesaemia (Mg)
- Baseline ECG >500 ms**

YES

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.

NO

Initiating a HIGH risk medication*?
(excluding single/one-time doses)
- Anagrelide
- Arsenic trioxide
- Chlorpromazine
- Clarithromycin
- Disopyramide
- Dofetilide (refer to pharmacy policy)
- Dronedarone
- Erythromycin
- Flecaïnide
- Ibutilide
- Pentamidine
- Procainamide
- Quinidine
- Sotalol (refer to pharmacy policy)

YES

NO

Initiating a MODERATE risk medication*?
(excluding single/one-time doses)
- Amiodarone
- Azithromycin
- Ciprofloxacin
- Citalopram
- Escitalopram
- Fluconazole
- Haloperidol*
- Levofloxacin
- Methadone
- Ondansetron

*This is for doses >6mg/day as this is where the increased risk of QTc prolongation is observed

NO

Does the patient meet ≥ 2 risk factors below?
- Age >65 years
- Female
- CHF
- Coronary ischemia
- Bradycardia
- K+ < 3.0 mmol/L
- iCa <3.5 mg/dL
- Mg <1.4 mg/dL
- Genetic disposition to QT prolongation
- Use of other high or moderate risk drugs, see above (add 1 risk factor per drug)

NO

MODERATE Risk Monitoring
- No QTc monitoring recommended.
- Reevaluate risk factors daily while patient is receiving a moderate risk medication.

YES

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

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References


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Guideline Approved


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