QTc RISK CLINICAL DECISION SUPPORT:
A PRIMER FOR HEALTHCARE PROVIDERS

MODULE 4: Clinical Decision Support
for Prolonged QTc

QTc—CDS
CLINICAL DECISION SUPPORT

QTc Risk Clinical Decision Support:
Clinical Decision Support for Prolonged QTc

CLINICAL DECISION SUPPORT FOR PROLONGED QTC

QTc—CDS
CLINICAL DECISION SUPPORT

Clinical decision support for prolonged QTc

Thank you for your interest in this educational program
"QTc Risk Clinical Decision Support: A Primer For Healthcare Providers."
This educational module — number four in a series of four — will discuss
Clinical Decision Support for Prolonged QTc.

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QTc CDS
CLINICAL DECISION SUPPORT

SLIDE ONE: RISK OF TORSADES WARNING CDS

Torsades Warning Clinical Decision Support

The risk of Torsades can be automated in electronic medical records using an algorithm to predict the likelihood that a patient might have prolonged QTc which then may result in torsades de pointes. Displayed below is the current Torsades warning displayed in the Banner Healthcare System with respect to the medication the patient is taking. This will be discussed later

QTc RISK CLINICAL DECISION SUPPORT:
A PRIMER FOR HEALTHCARE PROVIDERS
MODULE 4: Clinical Decision Support
for Prolonged QTc

QTc CDS
CLINICAL DECISION SUPPORT

in the module. We will focus first on the clinical decision support logic behind in this particular warning.

SLIDE TWO: TISDALE QTC RISK SCORE

Tisdale QTc Risk Score ⚠️

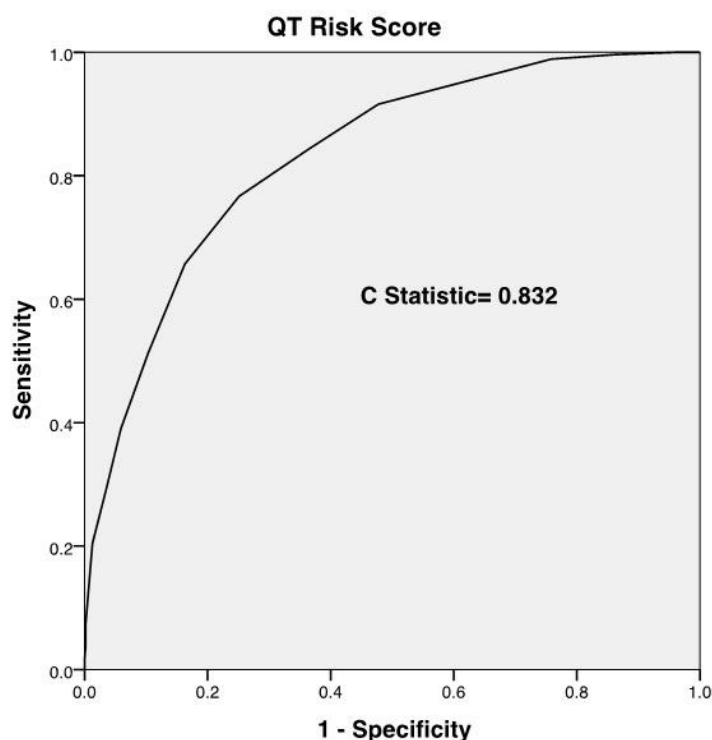| Risk Score Category	Risk Score	QTc Prolongation Derivation Group (n=900)	QTc Prolongation Validation Group (n=300)
Low	< 7	456 (51%)	159 (53%)
Moderate	7-10	319 (35%)	101 (34%)
High	11+	125 (14%)	40 (13%)

Tisdale et al. Circ Cardiovasc Outcomes 2013

This warning was developed through the Tisdale QTc Risk Score algorithm — developed by Dr. Jim Tisdale and his colleagues at Purdue University. They defined a patient as exhibiting a high likelihood of having high-risk prolonged QTc when their risk score registered an eleven or greater. This was found to be valid with a validation group as well as a derivation group.

QTc RISK CLINICAL DECISION SUPPORT:
A PRIMER FOR HEALTHCARE PROVIDERS
MODULE 4: Clinical Decision Support
for Prolonged QTc

QTc CDS
CLINICAL DECISION SUPPORT

SLIDE THREE: PREDICTIVE PERFORMANCE OF THE QTC RISK SCORE

Predictive Performance of the QTc Risk Score

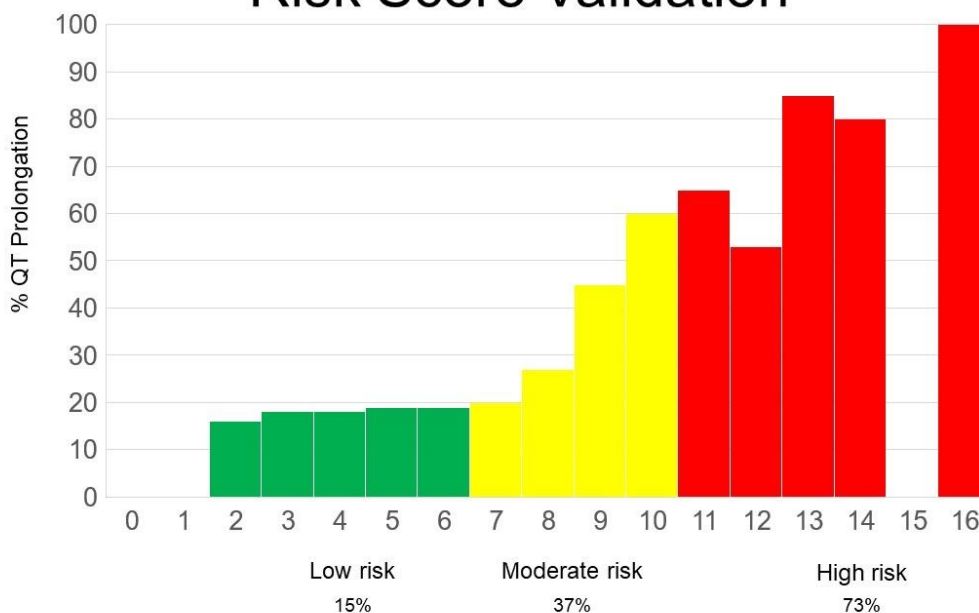| Risk Category	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Moderate Risk	0.67	0.88	0.55	0.88
High Risk	0.74	0.77	0.79	0.76

QT Risk Score

C Statistic= 0.832

Circ CV Qual Outcomes 2013;6:479-487.

The slide displayed above represents the performance of the QTc Risk Score with good sensitivity and specificity. This particular clinical decision tool uses a cut-point of eleven for high risk or seven for moderate risk, and shows relatively good performance.

SLIDE FOUR: RISK SCORE VALIDATION

**QTc RISK CLINICAL DECISION SUPPORT:
A PRIMER FOR HEALTHCARE PROVIDERS**

MODULE 4: Clinical Decision Support
for Prolonged QTc

QTc CDS
CLINICAL DECISION SUPPORT

Risk Score Validation

Circ Cardiovasc Qual Outcomes 2013;6:479-487

In the above Risk Score Validation chart, Green represents low risk. Yellow represents moderate risk and red are patients with the highest risk for prolonged QTc: individuals scoring eleven or greater according to Tisdale validation. This information was then automated in an electronic health care record system within Banner.

SLIDE FIVE: TORSADES WARNING
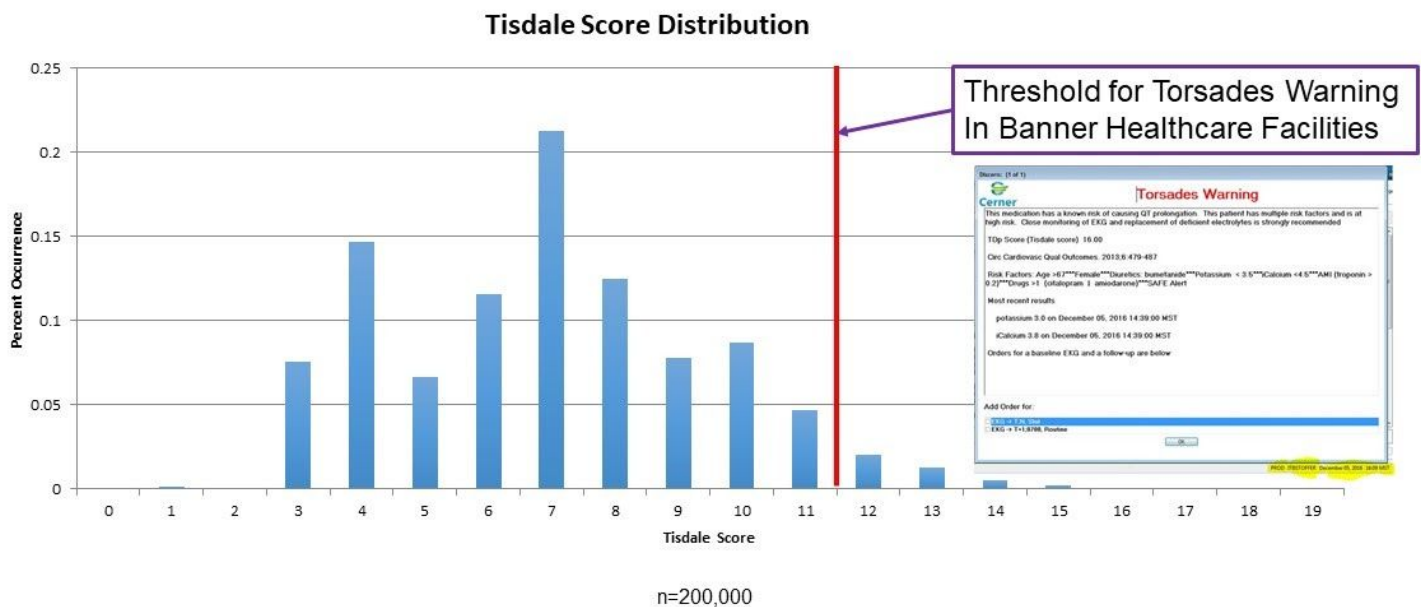
Torsades Warning

- What action triggers a warning message?
  - Ordering a medication with known risk of TdP and patient has Tisdale QTc Risk Score > 12

- How often does this alert fire?
  - Currently in ICU environments, warning appears 6 times per day across all 28 Banner facilities

The warning message is generated when a particular score is calculated to exceed twelve — a little higher than what Tisdale group calculated. This improves on the specificity of the warning such that it doesn't over-alert clinicians concerning patients who might be at lower risk. A current analysis of intensive care units suggests across the 28 Banner facilities that the warning is currently appearing about six times a day. This warning meets the definition of a good clinical decision support tool in that it is not overly sensitive and therefore specific to the patients that the warning does trigger for, as most patients are not going to be at risk for prolonged QTc.

SLIDE SIX: DISTRIBUTION OF TISDALE SCORE FOR PROLONGED QTC IN BANNER HEALTH

Distribution of Tisdale Score for Prolonged QTc in Banner Health

This histogram represents the distribution of the Tisdale score in our testing mode for the prolonged QTc clinical decision support tool. It shows that having higher scores is a relatively uncommon occurrence in the Banner Healthcare System and therefore it is unlikely clinicians will be overwhelmed by the normal alerts.

QTc RISK CLINICAL DECISION SUPPORT:
A PRIMER FOR HEALTHCARE PROVIDERS

MODULE 4: Clinical Decision Support

for Prolonged QTc

QTc CDS
CLINICAL DECISION SUPPORT

SLIDE SEVEN: COMPREHENSIVE SOURCE FOR DRUG-INDUCED PROLONGED QTC

When an alert does occur, it is due to a medication with a known risk of prolonging the QTc and TdP. The CredibleMeds website is the international authoritative source for medications and risk of prolonged QTc and torsades de pointes. Crediblemeds is a non-profit organization that constantly scans for drug safety signals related to prolonged QTc and torsades de pointes. Information about the risk for various medications is provided free of charge but users are asked to register so that they can

QTc RISK CLINICAL DECISION SUPPORT:
A PRIMER FOR HEALTHCARE PROVIDERS

MODULE 4: Clinical Decision Support
for Prolonged QTc

QTc—CDS
CLINICAL DECISION SUPPORT

receive updates when new drugs are added or classification of the risk is changed.

SLIDE EIGHT: HOW DO I MANAGE A PATIENT WITH PROLONGED QTC?

How do I manage a patient with prolonged QTc?

- Correct underlying electrolyte imbalances

- Order an ECG to monitor QTc

- When appropriate, prescribe alternative medications not associated with risk of TdP
    - CredibleMeds app
    - Pharmacy consultation

The first thing to consider when discussing how to manage patients with a prolonged QTc is resolving the underlying electrolyte imbalances, if the patient has any — by increasing potassium, magnesium calcium to appropriate therapy levels. The second thing to consider is ordering an ECG to monitor the patient's QTc. The QTc clinical decision support tool does not rely on a QTc measurement being present in the electronic health care record. On the other hand, if it is present it is added into the

calculation score. One thing that should be considered — when appropriate — is prescribing a medication not associated with the risk of TdP. You can consult the CredibleMeds website or app for safe alternatives. Another option is to contact the pharmacy personnel to help identify suitable alternatives.

SLIDE NINE: RISK OF TORSADES WARNING CDS

QTc RISK CLINICAL DECISION SUPPORT:
A PRIMER FOR HEALTHCARE PROVIDERS
MODULE 4: Clinical Decision Support
for Prolonged QTc

QTc CDS
CLINICAL DECISION SUPPORT

Displayed above is a Torsades warning for a patient who is a 70 year old female. The information about the patient's risk factors is presented first. The patient is greater than age 67, the patient is female — which constitutes a greater risk of prolonged QTc than if the patient were male — the patient has low potassium, low magnesium and low calcium. The latest lab results shown below measure the patient's potassium at 2.9; magnesium at 1.8; and ionized calcium at 3.9.

The patient is also taking ondansetron and citalopram. Those are other risk factors. Those are both medications that have been known to prolong the QTc. The calculated score for this particular individual is fifteen — greater than the threshold of twelve; and we know that a score of eleven or higher represents a patient with higher risk for prolonged QTc. Located on the lower part of the screen are options for addressing the underlying electrolyte abnormalities and for ordering an ECG or EKG.

The medication that triggered the alert in this particular case was amiodarone. The incoming order can be cancelled or the clinician can cancel one of the other medications that the patient is on that are associated with Prolonged QTc. This is the clinical decision support for prolonged QTc and this has been operationalized in the Banner Healthcare system.

To complete this final module in our four-part series, please continue to the TOOLS section of this module's webpage for a short quiz that will test your knowledge of the presented information.

MODULE FOUR KNOWLEDGE TEST

Thank you for your time and for your interest in this educational program "Clinical Decision Support for Prolonged QTc." We hope you have enjoyed this four-part educational series.

Thank you

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