

Mayo Clinic creates institution-wide electronic prolonged QT interval warning system

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Using a one-of-a-kind computer-aided program, Mayo Clinic has developed and implemented a Mayo-wide electronic warning system to identify patients at risk of QT-related deaths from an abnormality in the heart's electrical system. The system informs all physicians, regardless of their specialty or QT awareness, if their patient's ECG activated the QT alarm. In addition, the researchers discovered that the death rate of patients whose 12-lead electrocardiogram (ECG) activated the QT alert was nearly four times greater than all other patients who had an ECG. The findings are published in the current issue of *Mayo Clinic Proceedings*.

The heart rate corrected QT interval, or QTc, from the ECG reflects the health of the heart's electrical recharging system. A prolonged QT interval may indicate that the heart's [electrical system](#) is reacting to medical conditions including genetic-mediated [long QT syndrome](#) (LQTS), electrolyte abnormalities or medications. Regardless of the cause, a prolonged QTc (greater than 500 milliseconds) has been recognized as a non-invasive risk marker for congenital or acquired LQTS-triggered sudden death, stroke and all-cause [cardiovascular mortality](#).

The QT issue has emerged as an important safety issue in medicine, says lead author says Michael Ackerman, M.D., Ph.D., a pediatric cardiologist with the [Mayo Clinic](#) Children's Center. The [American](#)

[Heart Association](#) (AHA) has called for better surveillance to prevent drug-induced [sudden cardiac death](#) among hospitalized [patients](#) whose medications have QT problems as a potential side effect.

Mayo implemented the warning system as a result of this call from AHA and because such QT-prolonging medications are prescribed by physicians in many specialties. "This type of [early warning system](#) is an ideal use of computer technology and [electronic medical records](#) to help busy clinicians at the bedside keep their patients safe," said Richard Kovacs, M.D., Professor of Clinical Medicine at the Indiana University School of Medicine, who serves on the AHA/ACC Taskforce on Practice Guidelines.

More than 100 U.S. Food and Drug Administration-approved medications are known to prolong the QT interval and potentially trigger drug-induced LQTS and sudden death. For example, antidepressants can be tolerated well by a patient, but if the patient also is taking an antibiotic with QT-prolonging potential and has electrolyte abnormalities, "this could be a perfect QT storm and often the physician may not know that such a storm may be brewing," says Dr. Ackerman, director of Mayo's LQTS Clinic and Windland Smith Rice Cardiovascular Genomics Research Professor.

Between November 1, 2010 and June 30, 2011, 86,107 ECGs were performed in 52,579 patients. Results showed that 2 percent or 1,145 patients had one or more ECGs that received a "QT alert," meaning that when a patient's ECG showed a QTc of more than 500 ms, the physician who ordered the ECG got an electronic alert along with a link to the internal Mayo Clinic website AskMayoExpert, which provides information to guide the physician on the patient's care, according to Dr. Ackerman. Of these patients, 470 patients had no other electrocardiographic reasons to explain the prolonged QTc and importantly, the death rate was four times higher in the year following

the ECG than all of the other patients who got ECGs.

"In fact, without knowing any other factors, almost 20 percent of the patients with an alerted QTc had died within one year of that alert," Dr. Ackerman says.

The researchers learned a lot more. Specifically, they recorded the clinical diagnoses, laboratory abnormalities and medications known to influence the QTc and developed a new pro-QTc score which tallies the number of potential QTc-aggravating diseases, laboratory abnormalities and drugs present in each patient whose ECG generated a QTc alert. It turns out that why someone is above 500 ms is more predictive of death risk than just being above 500 ms, Dr. Ackerman says.

If a patient was above 500 ms because of genetic LQTS, the risk of death was 0 percent, most likely reflecting an otherwise potentially high risk patient who had already been diagnosed and effectively treated. If a patient's pro-QTc score was equal to or greater than 4 because of a medical condition, low potassium, and being treated with two medications with QT-prolonging potential, the one-year risk of death climbed to 40 percent, Dr. Ackerman says.

Provided by Mayo Clinic

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