Marten van den Berg[1], Marieke Niemeijer[2], Peter Rijnbeek[1], Mark Eijgelsheim[2,3] , Bruno Stricker[2,3,4] and Jan Kors[1]

1) Department of Medical Informatics, Erasmus MC – University Medical Center Rotterdam, Rotterdam, the Netherlands

2) Department of Epidemiology, Erasmus MC – University Medical Center Rotterdam, Rotterdam, the Netherlands

3) Department of Internal Medicine, Erasmus MC – University Medical Center Rotterdam, Rotterdam, the Netherlands

4) Inspectorate of Health Care, the Hague, the Netherlands

QT variability as a predictor of sudden cardiac death in a general population

Background: Sudden cardiac death (SCD) is an important healthcare problem. Currently, the main electrocardiographic (ECG) marker for SCD is heart rate corrected QT prolongation. This marker, however, has its limitations. A number of animal studies, small case-control studies and studies in patients with implantable cardioverter-defibrillators suggested that short-term variability of the QT interval may be a better predictor for SCD. Different markers of QT variability have been proposed, their associations with SCD have not yet been compared in the general population.

Methods: The study was performed as part of the Rotterdam study, a population-based cohort study of middle-aged and elderly persons. We used fiducial segment averaging to determine the QT intervals of all beats on a standard 10-second 12-lead ECG. As QT variability markers we calculated the short-term variability of the QT interval (STVqt), the standard deviation of the QT interval (SDqt) and the QT variability index (QTVI). We used Cox' proportional hazard model to estimate the effect of these markers on the occurrence of SCD, both in the overall population and for men and women separately. We adjusted for age, QT interval and heart rate. QT variability measurements were grouped in quartiles, and hazard ratios (HRs) of the highest versus the lowest quartile were computed.

Results: 5,532 women and 3,880 men with available ECGs at baseline were included. During a median follow-up time of 10.5 years (1^{st}- 3^{rd} quartile 7.7-17.4 years) 459 cases of SCD occurred. In the overall population, STVqt (HR 1.36, 95% confidence interval (CI) 1.04-1.74) and SDqt (HR 1.49, 95%CI 1.14-1.96) were significantly associated with SCD . In the analysis separate in men and women, STVqt and SDqt were only significantly associated with SCD in women (STVqt HR 1.48, 95% CI 1.02-2.15; SDqt HR 1.91, 95% CI 1.27-2.86). QTVI was not significantly associated with SCD in either men, women or the overall population.

Conclusion: QT variability was associated significantly with SCD. The association was stronger in women. Reasons for this could be different underlying conditions leading to SCD in men and women or different electrophysiology in women. Our study shows that fiducial segment averaging can be used to generate QT variability markers on standard ECGs.