Modeling of the Effect of Alcohol on Episode Patterns in Atrial Fibrillation

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Introduction: Growing evidence shows that alcohol trigger paroxysmal atrial fibrillation (PAF) in some patients. However, there is a lack of methods for assessing the causality between the triggers and atrial fibrillation (AF) episodes. Accordingly, this work aims to develop an approach to episode pattern modeling under the influence of alcohol for the purpose of evaluating causality assessment methods.

Methods: The alternating, bivariate Hawkes model is used to model episode patterns, where conditional intensity function $\lambda_1(t)$ defines the transitions from sinus rhythm (SR) to AF. The effect of alcohol consumption is characterized by an alcohol body reactivity function, defined by the base intensity $\mu_1(t)$, which alters $\lambda_1(t)$. Fifty 24-h long AF patterns for each number of alcohol units, ranging from 0 to 15, were modeled.

Results: AF burden and the number of episodes increased linearly by increasing consumed alcohol units. Mean AF burden without alcohol was 17.2%, which doubled with 10 alcohol units, and the number of AF episodes doubled from 12.9 episodes with 9 alcohol units. The aggregation tended to decrease after 7 alcohol units.

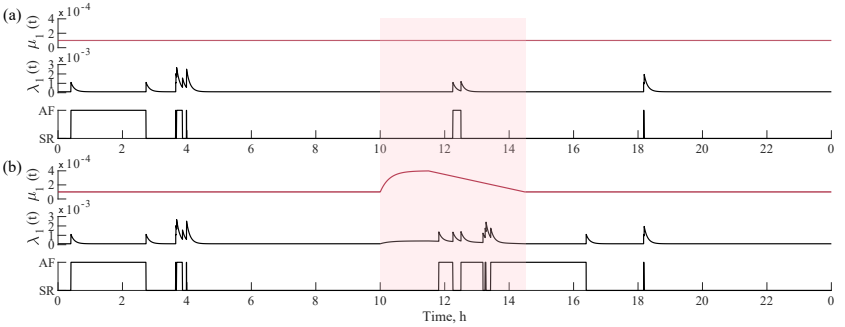

Fig. 1. Base intensity $\mu_1(t)$, conditional intensity function $\lambda_1(t)$, and AF pattern (a) without and (b) with added alcohol component.

Conclusion: The proposed model of alcohol-affected PAF patterns may be useful for assessing the methods for evaluation of causality between triggers and PAF occurrence.