Automatic Arrhythmia Detection based on RR Series Recorded through Bed Sensor during Sleep

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Arrhythmia is a widely recognized cardiovascular risk factor associated with an increase of overall mortality. In patients with cardiac rhythm disorders growing interest has been focused in recent years on concomitant comorbidities, including sleep disorders. A high frequency of cardiac arrhythmias among patients with sleep disorders was reported. During sleep studies visual analysis of electrocardiographic (ECG) signals is commonly performed to diagnose cardiac rhythm disorders, but it often results difficult because of the great amount of information that examinations provides. Hence, there is the need for minimally-intrusive recording of cardiac activity during sleep and for the development of automatic, robust methods for arrhythmia detection, which could improve the recognition of patterns of clinical interest and assist physicians in the diagnose of cardiac diseases. At this regard, we record an ECG using a bed sensor consisting in Emfit sensor foils placed into a bed mattress which allowed for a noncontact and unobtrusive recording. We present a method for automatic arrhythmia detection based on the analysis of a beat to beat interval (RR) series. The RR series was obtained from an ECG signal acquired from a subject during sleep. Threshold values were obtained from $\pm$ the 95th percentile of the RR series. For each RR interval the signal trend was added to the threshold value in order to obtain an adaptive threshold. Peaks exceeding thresholds were considered as arrhythmic. When compared to the results of arrhythmia detection performed on the ECG signal using Cardioline Cube HOLTER analysis software our method achieved a sensitivity of 72%. These results suggest that the bed sensor could represent a reliable tool to assist the clinician in arrhythmia detection and diagnosis formulation.