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**Gupta et al.**

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(54) **NON-INVASIVE METHOD AND SYSTEM FOR CHARACTERIZING CARDIOVASCULAR SYSTEMS FOR ALL-CAUSE MORTALITY AND SUDDEN CARDIAC DEATH RISK**

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CPC ..... **A61B 5/04012** (2013.01); **A61B 5/021** (2013.01); **A61B 5/0205** (2013.01); **A61B 5/029** (2013.01); **A61B 5/044** (2013.01);  
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(58) **Field of Classification Search**  
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See application file for complete search history.

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(57) **ABSTRACT**

Methods and systems for evaluating the electrical activity of the heart to identify novel ECG patterns closely linked to the subsequent development of serious heart rhythm disturbances and fatal cardiac events. Two approaches are describe, for example a model-based analysis and space-time analysis, which are used to study the dynamical and geometrical properties of the ECG data. In the first a model is derived using a modified Matching Pursuit (MMP) algorithm. Various metrics and subspaces are extracted to characterize the risk for serious heart rhythm disturbances, sudden cardiac death, other modes of death, and all-cause mortality linked to different electrical abnormalities of the heart. In the second method, space-time domain is divided into a number of regions (e.g., 12 regions), the density of the ECG signal is computed in each region and input to a learning algorithm to associate them with these events.

**19 Claims, 19 Drawing Sheets**

NON-INVASIVE METHOD AND SYSTEM FOR CHARACTERIZING CARDIOVASCULAR SYSTEMS

