**Additional information** for the paper **"*Identifying sudden cardiac death risk and specifying its occurrence time by analyzing electrocardiograms in natural time*"**

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**Appendix 1.**

**The ECG data analyzed.**

The data analyzed in natural time are 159 long-time ECG recordings (each lasting for several hours to around 24 h) which come from the following databases[1]: (i) the MIT-BIH Normal Sinus Rhythm Database (nsrdb) containing 18 H, digitized with frequency $F_s$=128 Hz, (ii) the Normal Sinus Rhythm RR Interval Database (nsr2db) containing 54 H, $F_s$=128 Hz (iii) the Congestive Heart Failure RR Interval Database containing 29 subjects with congestive heart failure (chf2db), $F_s$=128 Hz, (iv) the BIDMC Congestive Heart Failure Database (chfdb) with 15 subjects with severe congestive heart failure, $F_s$=250 Hz (v) the MIT-BIH Atrial Fibrillation Database (afdb) with 25 subjects with atrial fibrillation (AF) mostly paroxysmal, $F_s$=250 Hz and (vi) the Sudden Cardiac Death Holter Database (sddb), $F_s$=250 Hz. The latter contains 24 SD among which 12 had ECG with *audited* annotations. Here, beyond these 12 individuals, we studied six more (i.e., 33, 37, 44, 47, 48, 50) whose ECG could be analysed with confidence. Thus, we consider 18 (out of 24) SD individuals of the sddb.

The results presented in this paper refer to the RR intervals (see Fig. 1 of the main text), i.e., $Q_m$=$RR_m$. For reasons explained in the main text, the study is also extended (in all these 159 individuals except the 25 AF for which NN annotations were not available) to the so called NN intervals, i.e., $Q_m$=$NN_m$; these are intervals obtained from ECG annotation files by using the option[2] "-c -PN –pN", which yields only intervals between consecutive *normal* beats and intervals between pairs of *normal* beats surrounding an ectopic beat are discarded from the output.

In both the RR and NN time series, in order to exclude "outliers" from the records, the detection algorithm proposed in Ref. 3 has been

applied, i.e., for each set of five contiguous intervals, if the local mean, excluding the central interval, is larger than twice the central interval then this interval is excluded from further analysis. In Fig. 3(a) one H out of 72, i.e., the one labelled 16539, has been disregarded because the resulting $\Delta S_3[NN]$ value was unusually high compared to that in other H of nsrdb. Furthermore, in Fig. 3(b) three H out of 72, i.e., 16539, nsr024 and nsr044, have been also disregarded since they have $\Delta S_3[RR]$ value unusually higher than that in other H (see Table 2 deposited in the same directory as this file).

The annotators used in the aforementioned databases are: (i) For the nsrdb the annotator *.atr, which is reference annotator. (ii) For the nsr2db the annotator *.ecg which is corrected beat annotations from an automatic detector. (iii) For the chf2db the *.ecg annotator, which is a corrected beat annotator from an automated detector (iv) For the chfdb the *.ecg annotator, which is an unaudited beat annotator from an automatic detector. (v) For the afdb the *.qrs, which is unaudited beat annotations. (vi) Finally, for the sddb, the 12 SD, as mentioned above, had ECG with audited annotations (*.atr); concerning the additional 6 SD analyzed, the annotator *.ari, was used, which is unaudited annotator.

**References**

[1] A.L. Goldberger, L.A.N. Amaral, L. Glass, J.M. Hausdorff, P.Ch. Ivanov, R.G. Mark, J. E. Mietus, G. B. Moody, C.-K. Peng, and H. E. Stanley, Circulation **101,** E215 (2000) (see also http://www.physionet.org).

[2] See http://www.physionet.org/physiotools/wag/ann2rr-1.htm

[3] P.C. Ivanov, L.A.N. Amaral, A.L. Goldberger, S. Havlin, M.G. Rosenblum, Z.R. Struzik, and H.E. Stanley, Nature **399,** 461 (1999).