Supplementary Materials: Challenging Recently Published Parameter Sets for Entropy Measures in Risk Prediction for End-Stage Renal Disease Patients

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Online Supplement

Baseline differences between patients without heart disease (HD) and with HD were assessed by the chi-squared test for categorical data. Quantitative data were tested for normality using the Kolmogorov–Smirnov test. The *t*-test was used to test differences for normally distributed data; otherwise the Wilcoxon rank-sum test was used.

Clinical baseline data comparing these groups are visualized in Table S1. Age, adapted Charlson comorbidity index (adapted CCI), serum albumin, and anticoagulant medication were significantly different between these groups.

Table S1. Baseline data of patients grouped by patients without heart disease (HD) and with HD. Data are given as *n* (%) for categorical data, mean (SD) or median [IQR].

	No HD ($n = 166$)	**HD ($n = 99$)**	p
Age (years)	59.7 (16.1 SD)	66 (12.6 SD)	<0.001
Sex—male, *n* (%)	111 (67 %)	64 (65 %)	0.93
Body weight (kg)	77.2 (20.1 SD)	76.9 (17 SD)	0.89
Height (m)	1.71 (0.0867 SD)	1.71 (0.0805 SD)	1
Body mass index (kg/m^2)	24.9 [22.4,28.7]	25.4 [22.7,28.4]	0.91
Presence of diabetes, *n* (%)	58 (35 %)	34 (34 %)	1
Presence of hypertension, *n* (%)	157 (95 %)	93 (94 %)	0.98
Current smokers, *n* (%)	46 (28 %)	26 (26 %)	0.8
Adapted CCI (-)	2 [0,4]	4 [2,6]	<0.001
Dialysis vintage (mo)	42.3 [23.5,78.4]	54.9 [24.4,83.3]	0.28
Dialysis duration per session (h)	4.25 [4.02,4.57]	4.22 [4.02,4.54]	0.5
UFV (ml)	2168 (1166 SD)	2244 (1145 SD)	0.6
Kt/V (-)	1.46 (0.419 SD)	1.49 (0.363 SD)	0.65
Serum albumin (g/dl)	4.07 (0.399 SD)	3.97 (0.381 SD)	0.04
hsCRP (mg/dl)	0.352 [0.14,0.722]	0.443 [0.197,0.979]	0.14
Total cholesterol (mg/dl)	184 (46 SD)	175 (42.6 SD)	0.13
HDL cholesterol (mg/dl)	42 [36,52.3]	43 [36.5,52]	0.81
LDL cholesterol (mg/dl)	115 (35.9 SD)	106 (35.6 SD)	0.06
Calcium $\times$ phosphate (mmol^2/l^2)	3.88 (1.21 SD)	4.04 (0.994 SD)	0.25
Antihypertensive drugs, n (%)	146 (88 %)	91 (92 %)	0.6
Statins, n (%)	52 (31 %)	45 (45 %)	0.07
Anticoagulant, n (%)	12 (7 %)	17 (17 %)	0.04

Abbreviations: SD = standard deviation, IQR = interquartile range, CCI = Charlson comorbidity index, mo = months, UFV = ultrafiltration volume, hsCRP = high sensitivity C-reactive protein, Kt/V = dialyzer clearance of urea · dialysis time / volume of distribution of urea.

Table S2 shows traditional heart rate variability (HRV) parameters and entropy measures at baseline. Patients with HD were (borderline) significantly lower in standard deviation of NN-intervals (SDNN), approximate entropy (ApEn(r_σ)), sample entropy (SampEn(r_σ)), and fuzzy entropy (FuzzyEn(r_{Chon})) compared to patients without HD. The other measures showed no significant differences.

Table S2. Heart rate variability (HRV) parameters of the time and frequency domain and entropy measures at baseline for patients without heart disease (HD) and patients with HD. Data are given as mean (SD) or median [IQR].

	No HD ($n = 166$)	**HD ($n = 99$)**	p
AVNN (ms)	886 (130 SD)	889 (132 SD)	0.85
SDNN (ms)	35.4 (19 SD)	31.5 (14.5 SD)	0.06
RMSSD (ms)	13.7 [9.12,22.3]	12.3 [9.59,18.6]	0.24
pNN50 (%)	0.552 [0.0559,2.91]	0.483 [0.0974,1.78]	0.85
HRVTI (-)	31.1 (10.3 SD)	29 (8.93 SD)	0.09
Total P (ms^2)	1177 [495,2311]	924 [483,1800]	0.22
LF (ms^2)	212 [57,500]	160 [95,353]	0.46
HF (ms^2)	63.3 [25.3,172]	54 [27.7,134]	0.33
LF/HF (-)	2.87 [1.32,6.76]	3.35 [1.52,5.85]	0.59
ApEn(r_{Chon}) (-)	0.333 [0.168,0.529]	0.34 [0.212,0.518]	0.11
ApEn(σ) (-)	1.08 (0.283 SD)	1.01 (0.307 SD)	0.06
SampEn(r_{Chon}) (-)	3.38 (0.577 SD)	3.32 (0.631 SD)	0.44
SampEn(σ) (-)	1 (0.333 SD)	0.913 (0.358 SD)	0.05
FuzzyEn(r_{Chon}) (-)	3.64 (0.596 SD)	3.49 (0.546 SD)	0.05
FuzzyEn(σ) (-)	0.705 (0.235 SD)	0.66 (0.242 SD)	0.14
FuzzyMEn(r_{Chon}) (-)	7.06 [6.3,7.96]	6.74 [6.14,7.62]	0.08
FuzzyMEn(σ) (-)	1.65 (0.54 SD)	1.53 (0.567 SD)	0.08
CApEn(r_{Chon}) (-)	7.4 [7.22,7.54]	7.39 [7.25,7.48]	0.32
CApEn(σ) (-)	1.38 (0.471 SD)	1.32 (0.515 SD)	0.31

Abbreviations: SD = standard deviation; IQR = interquartile range; AVNN = average time of NN-intervals; SDNN = standard deviation of NN-intervals; RMSSD = square root of the mean squared differences of adjacent NN-intervals; pNN50 = percentage of the number of NN intervals greater than 50ms; HRVTI = HRV triangular index; total P = totel frequency power; LF = low frequency (0.04-0.15 Hz) power; HF = high frequency (0.15-0.4 Hz) power; ApEn= approximate entropy; SampEn= sample entropy; FuzzyEn= fuzzy entropy; FuzzyMEn= fuzzy measure entropy; CApEn= corrected approximate entropy.