

Supplementary Table 1. Comparisons of clinical features among PNI category (N=1108)

| | Normal (n=874) | Moderate (n=94) | Severe (n=140) | P-value |
|---|-----------------------|------------------------|-----------------------|----------------|
| PNI score | 47.7 ± 6.5 | 36.8 ± 3.9** | 30.5 ± 3.8**†† | <0.001 |
| Age (years) | 65.3 ± 14.2 | 70.8 ± 15.8** | 72.3 ± 14.7** | <0.001 |
| Male gender (n, %) | 552 (63.2) | 50 (53.2) | 66 (47.1) | 0.001 |
| Body mass index (kg/cm ²) | 23.5 ± 4.0 | 23.4 ± 4.7 | 22.9 ± 4.9 | 0.300 |
| Systolic blood pressure (mmHg) | 126.9 ± 28.8 | 129.1 ± 31.4 | 130.4 ± 33.7 | 0.371 |
| Diastolic blood pressure (mmHg) | 72.2 ± 19.2 | 72.8 ± 19.2 | 71.4 ± 21.3 | 0.851 |
| Heart rate (bpm) | 78.1 ± 22.8 | 85.0 ± 24.1* | 91.6 ± 27.0** | <0.001 |
| NYHA class III or IV (n, %) | 20 (2.3) | 2 (2.1) | 11 (7.9) | 0.004 |
| Ischemic etiology (n, %) | 222 (25.4) | 24 (25.5) | 40 (28.6) | 0.800 |
| Co-morbidity | | | | |
| Hypertension (n, %) | 626 (71.6) | 66 (70.2) | 98 (70.0) | 0.005 |
| Diabetes (n, %) | 321 (36.7) | 46 (48.9) | 65 (46.4) | 0.025 |
| Dyslipidemia (n, %) | 681 (77.9) | 68 (72.3) | 117 (83.6) | 0.206 |
| Chronic kidney disease (n, %) | 439 (50.2) | 66 (70.2) | 93 (66.4) | <0.001 |
| Anemia (n, %) | 386 (44.2) | 67 (71.3) | 119 (85.0) | <0.001 |
| Atrial fibrillation (n, %) | 320 (36.6) | 30 (31.9) | 55 (39.3) | 0.702 |
| Laboratory data | | | | |
| Hemoglobin (g/dl) | 13.1 ± 2.1 | 11.6 ± 2.2** | 10.3 ± 2.3**†† | <0.001 |
| Total lymphocyte count (mm ³) | 1633.3 ± 968.1 | 1074.2 ± 433.0** | 884.2 ± 389.7** | <0.001 |
| Total protein (g/dl) | 7.1 ± 0.6 | 6.5 ± 0.8** | 6.0 ± 0.9**†† | <0.001 |
| Albumin (g/dl) | 4.0 ± 0.4 | 3.1 ± 0.2** | 2.6 ± 0.4**†† | <0.001 |
| Sodium (mEq/l) | 139.4 ± 3.2 | 137.4 ± 4.8** | 136.8 ± 5.1** | <0.001 |
| eGFR (ml/min/1.73 cm ²) | 58.6 ± 22.9 | 44.7 ± 30.4** | 46.6 ± 23.9** | <0.001 |
| Total cholesterol (mg/dl) | 181.5 ± 37.9 | 163.5 ± 38.0** | 148.0 ± 47.7** | <0.001 |
| Log C-reactive protein (mg/dl) | -0.77 ± 0.66 | -0.12 ± 0.76** | 0.28 ± 0.69**†† | <0.001 |
| Log BNP (pg/ml) | 2.3 ± 0.6 | 2.8 ± 0.6** | 2.7 ± 0.5** | <0.001 |
| Log troponin I (ng/ml) | -1.2 ± 0.8 | -0.8 ± 0.9** | -0.6 ± 0.9**†† | <0.001 |
| Log TNF-α (pg/ml) | 0.3 ± 0.4 | 0.3 ± 0.4 | 0.4 ± 0.4 | 0.712 |
| Log adiponectin (μg/ml) | 1.2 ± 0.3 | 1.4 ± 0.4 | 1.4 ± 0.2* | 0.009 |
| Echocardiography | | | | |
| LVEF (%) | 42.7 ± 16.0 | 42.2 ± 14.9 | 42.4 ± 15.6 | 0.945 |
| RV-FAC (%) | 40.1 ± 12.3 | 42.9 ± 12.3 | 40.0 ± 11.2 | 0.408 |
| IVC (mm) | 14.6 ± 4.6 | 16.2 ± 4.8 | 15.2 ± 5.6 | 0.074 |
| TRPG (mmHg) | 29.9 ± 16.8 | 32.8 ± 15.8 | 31.4 ± 14.4 | 0.386 |
| Cardiopulmonary exercise test | | | | |

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|----------------------------------|------------|------------|-------------|-------|
| Peak VO ₂ (ml/kg/min) | 16.0 ± 4.8 | 15.2 ± 4.5 | 13.5 ± 3.2* | 0.029 |
| VE/VCO ₂ slope | 34.2 ± 8.2 | 35.8 ± 9.0 | 36.8 ± 8.2 | 0.241 |

NYHA, New York Heart Association; eGFR, estimated glomerular filtration; BNP, B-type natriuretic peptide; TNF- α , tumor necrosis factor- α ; LVEF, left ventricular ejection fraction; RV-FAC, right ventricular fractional area change; IVC, inferior vena cava diameter; TRPG, tricuspid valve regurgitation; Peak VO₂, breath-by-breath oxygen consumption; VE/VCO₂ slope, slope of the relationship between ventilation and carbon dioxide production. *P<0.05 and **P<0.01 vs. normal group, †P<0.05 and ††P<0.01 vs. moderate group.

Supplementary Table 2. Comparisons of clinical features among GNRI category (N=1274)

| | Normal (n=704) | Mild (n=229) | Moderate (n=227) | Severe (n=114) | P-value |
|---|---------------------------|-------------------------|-----------------------------|---------------------------|----------------|
| GNRI score | 107.9 ± 7.5 | 95.0 ± 1.7** | 87.6 ± 2.7** | 75.5 ± 5.5***†‡‡‡ | <0.001 |
| Age (years) | 63.6 ± 14.2 | 68.7 ± 13.0** | 69.9 ± 14.6** | 70.9 ± 16.1** | <0.001 |
| Male gender (n, %) | 456 (64.8) | 133 (58.1) | 137 (60.4) | 53 (46.5) | 0.002 |
| Body mass index (kg/cm ²) | 25.3 ± 4.0 | 21.8 ± 2.7** | 21.3 ± 2.9** | 19.0 ± 2.9***†‡‡‡ | <0.001 |
| Systolic blood pressure (mmHg) | 126.9 ± 26.8 | 127.8 ± 31.7 | 128.6 ± 32.4 | 124.6 ± 36.1 | 0.680 |
| Diastolic blood pressure (mmHg) | 72.4 ± 18.2 | 74.3 ± 20.8 | 71.0 ± 20.2 | 71.8 ± 21.6 | 0.315 |
| Heart rate (bpm) | 76.6 ± 20.9 | 80.4 ± 25.1 | 84.4 ± 25.2** | 91.3 ± 27.7***†† | <0.001 |
| NYHA class III or IV (n, %) | 10 (1.4) | 6 (2.6) | 7 (3.1) | 12 (10.5) | <0.001 |
| Ischemic etiology (n, %) | 183 (26.0) | 55 (24.0) | 67 (29.5) | 26 (22.8) | 0.470 |
| Co-morbidity | | | | | |
| Hypertension (n, %) | 528 (75.0) | 159 (69.4) | 172 (75.8) | 73 (64.0) | 0.037 |
| Diabetes (n, %) | 270 (38.4) | 86 (37.6) | 100 (44.1) | 41 (36.0) | 0.361 |
| Dyslipidemia (n, %) | 565 (80.3) | 173 (75.5) | 169 (74.4) | 89 (78.1) | 0.207 |
| Chronic kidney disease (n, %) | 351 (49.9) | 122 (53.3) | 142 (62.6) | 72 (63.2) | 0.001 |
| Anemia (n, %) | 269 (38.2) | 127 (55.5) | 172 (75.8) | 92 (80.7) | <0.001 |
| Atrial fibrillation (n, %) | 256 (36.4) | 90 (39.3) | 80 (35.2) | 41 (36.0) | 0.817 |
| Laboratory data | | | | | |
| Hemoglobin (g/dl) | 13.5 ± 2.0 | 12.5 ± 2.0** | 11.5 ± 2.2***†† | 10.3 ± 2.2***†‡‡‡ | <0.001 |
| Total lymphocyte count (mm ³) | 1599.3 ± 952.0†† | 1456.7 ± 902.0†† | 1274.2 ± 688.4** | 1057.0 ± 546.8** | <0.001 |
| Total protein (g/dl) | 7.3 ± 0.6 | 6.9 ± 0.6 ** | 6.6 ± 0.8***†† | 6.1 ± 1.0 ***†‡‡‡ | <0.001 |
| Albumin (g/dl) | 4.1 ± 0.4 | 3.6 ± 0.3 ** | 3.2 ± 0.4 ***†† | 2.7 ± 0.5 ***†‡‡‡ | <0.001 |
| Sodium (mEq/l) | 139.8 ± 3.0 | 138.8 ± 3.4** | 137.8 ± 4.3***† | 137.1 ± 5.3***†† | <0.001 |
| eGFR (ml/min/1.73 cm ²) | 60.6 ± 23.1 | 55.3 ± 23.4 | 49.4 ± 25.6** | 47.1 ± 25.7** | <0.001 |
| Total cholesterol (mg/dl) | 184.8 ± 39.6 | 178.6 ± 37.8 | 166.1 ± 36.0** | 141.2 ± 46.4***†‡‡‡ | <0.001 |
| Log C-reactive protein (mg/dl) | 0.84 ± 0.61 | 0.58 ± 0.74** | -0.26 ± 0.75***†† | 0.10 ± 0.76***†‡‡‡ | <0.001 |
| Log BNP (pg/ml) | 2.2 ± 0.6 | 2.4 ± 0.5** | 2.7 ± 0.5***†† | 2.8 ± 0.5***†† | <0.001 |
| Log troponin I (ng/ml) | -1.2 ± 0.7 | -1.0 ± 0.8* | -0.9 ± 0.8** | -0.6 ± 0.9***†‡‡‡ | <0.001 |
| Log TNF-α (pg/ml) | 0.3 ± 0.4 | 0.3 ± 0.5 | 0.4 ± 0.5 | 0.4 ± 0.4 | 0.066 |
| Log adiponectin (μg/ml) | 1.1 ± 0.3 | 1.3 ± 0.3** | 1.4 ± 0.2** | 1.4 ± 0.3** | <0.001 |

Echocardiography

| | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------|
| LVEF (%) | 43.1 ± 15.9 | 40.1 ± 16.8 | 41.4 ± 14.7 | 41.0 ± 16.5 | 0.082 |
| RV-FAC (%) | 40.8 ± 12.1 | 41.1 ± 11.5 | 38.9 ± 13.7 | 40.6 ± 10.9 | 0.570 |
| IVC (mm) | 14.6 ± 4.5 | 15.3 ± 5.6 | 15.1 ± 5.1 | 14.4 ± 4.8 | 0.264 |
| TRPG (mmHg) | 29.0 ± 15.4 | 30.2 ± 16.8 | 32.7 ± 18.5 | 31.4 ± 13.8 | 0.089 |

Cardiopulmonary exercise test

| | | | | | |
|----------------------------------|------------|--------------|--------------|------------|--------|
| Peak VO ₂ (ml/kg/min) | 16.4 ± 4.6 | 15.1 ± 5.3 | 14.8 ± 4.5 | 13.9 ± 3.0 | 0.004 |
| VE/VCO ₂ slope | 32.9 ± 7.4 | 36.2 ± 8.4** | 37.0 ± 9.5** | 34.9 ± 6.6 | <0.001 |

NYHA, New York Heart Association; eGFR, estimated glomerular filtration; BNP, B-type natriuretic peptide; TNF- α , tumor necrosis factor- α ; LVEF, left ventricular ejection fraction; RV-FAC, right ventricular fractional area change; IVC, inferior vena cava diameter; TRPG, tricuspid valve regurgitation; Peak VO₂, breath-by-breath oxygen consumption; VE/VCO₂ slope, slope of the relationship between ventilation and carbon dioxide production.

*P<0.05 and **P<0.01 vs. normal group, †P<0.05 and ††P<0.01 vs. mild group, ‡P<0.05 and ‡‡P<0.01 vs. moderate group.

Supplementary Table 3. Comparisons of clinical features among CONUT score category (N=710)

| | Normal (n=262) | Mild (n=305) | Moderate-Severe (n=143) | P-value |
|---|-----------------|------------------|-------------------------|---------|
| CONUT score | 0.6 ± 0.5 | 2.8 ± 0.8** | 6.7 ± 1.9**†† | <0.001 |
| Age (years) | 62.2 ± 13.5 | 67.1 ± 13.4** | 71.0 ± 14.8**†† | <0.001 |
| Male gender (n, %) | 169 (64.5) | 204 (66.9) | 76 (53.1) | 0.017 |
| Body mass index (kg/cm ²) | 24.1 ± 4.1 | 23.1 ± 3.8* | 22.8 ± 5.0** | 0.003 |
| Systolic blood pressure (mmHg) | 123.0 ± 22.7 | 122.5 ± 26.7 | 130.4 ± 32.3*†† | 0.008 |
| Diastolic blood pressure (mmHg) | 69.6 ± 14.8 | 69.8 ± 18.1 | 71.9 ± 19.1 | 0.403 |
| Heart rate (bpm) | 74.6 ± 19.6 | 75.0 ± 19.0 | 86.2 ± 24.4**†† | <0.001 |
| NYHA class III or IV (n, %) | 3 (1.1) | 8 (2.6) | 8 (5.6) | 0.030 |
| Ischemic etiology (n, %) | 51 (19.5) | 78 (25.6) | 35 (24.5) | 0.207 |
| Co-morbidity | | | | |
| Hypertension (n, %) | 164 (62.6) | 209 (68.5) | 96 (67.1) | 0.316 |
| Diabetes (n, %) | 82 (31.3) | 119 (39.0) | 71 (49.7) | 0.001 |
| Dyslipidemia (n, %) | 212 (80.9) | 233 (76.4) | 109 (76.2) | 0.364 |
| Chronic kidney disease (n, %) | 111 (42.4) | 166 (54.4) | 91 (63.6) | <0.001 |
| Anemia (n, %) | 65 (24.8) | 151 (49.5) | 107 (74.8) | <0.001 |
| Atrial fibrillation (n, %) | 93 (35.5) | 118 (38.7) | 55 (38.5) | 0.709 |
| Laboratory data | | | | |
| Hemoglobin (g/dl) | 14.0 ± 1.6 | 12.7 ± 1.9 ** | 11.0 ± 2.3**†† | <0.001 |
| Total lymphocyte count (mm ³) | 2061.5 ± 1211.1 | 1229.1 ± 451.6** | 931.3 ± 375.2**†† | <0.001 |
| Total protein (g/dl) | 7.3 ± 0.6 | 7.0 ± 0.6 ** | 6.3 ± 0.9 **†† | <0.001 |
| Albumin (g/dl) | 4.2 ± 0.4 | 3.9 ± 0.4 ** | 2.9 ± 0.5 **†† | <0.001 |
| Sodium (mEq/l) | 140.4 ± 2.5 | 139.1 ± 3.5 | 137.4 ± 5.1**†† | <0.001 |
| eGFR (ml/min/1.73 cm ²) | 63.2 ± 19.9 | 54.7 ± 23.1** | 47.8 ± 24.9**† | <0.001 |
| Total cholesterol (mg/dl) | 198.8 ± 33.9 | 172.9 ± 35.0** | 143.3 ± 38.0**†† | <0.001 |
| Log C-reactive protein (mg/dl) | -0.97 ± 0.49 | -0.74 ± 0.67** | 0.001 ± 0.71**†† | <0.001 |
| Log BNP (pg/ml) | 2.1 ± 0.5 | 2.3 ± 0.6** | 2.8 ± 0.5**†† | <0.001 |
| Log troponin I (ng/ml) | -1.4 ± 0.5 | -1.3 ± 0.7* | -1.0 ± 0.8**†† | <0.001 |
| Log TNF-α (pg/ml) | 0.2 ± 0.2 | 0.2 ± 0.2 | 0.4 ± 0.4*† | 0.011 |
| Log adiponectin (μg/ml) | 1.0 ± 0.3 | 1.1 ± 0.3 | 1.4 ± 0.2**†† | <0.001 |
| Echocardiography | | | | |
| LVEF (%) | 44.6 ± 16.2 | 42.2 ± 16.0 | 41.1 ± 15.7 | 0.077 |
| RV-FAC (%) | 40.9 ± 11.4 | 40.2 ± 12.5 | 41.5 ± 14.2 | 0.763 |
| IVC (mm) | 13.9 ± 3.8 | 14.6 ± 4.5 | 16.0 ± 6.1 | <0.001 |
| TRPG (mmHg) | 29.5 ± 18.4 | 30.0 ± 16.0 | 34.8 ± 17.8 | 0.038 |
| Cardiopulmonary exercise test | | | | |

| | | | | |
|----------------------------------|------------|------------|------------|-------|
| Peak VO ₂ (ml/kg/min) | 16.2 ± 4.3 | 15.4 ± 4.4 | 14.7 ± 4.0 | 0.195 |
| VE/VCO ₂ slope | 34.4 ± 7.7 | 34.5 ± 9.2 | 36.2 ± 8.1 | 0.557 |

NYHA, New York Heart Association; eGFR, estimated glomerular filtration; BNP, B-type natriuretic peptide; TNF- α , tumor necrosis factor- α ; LVEF, left ventricular ejection fraction; RV-FAC, right ventricular fractional area change; IVC, inferior vena cava diameter; TRPG, tricuspid valve regurgitation; Peak VO₂, breath-by-breath oxygen consumption; VE/VCO₂ slope, slope of the relationship between ventilation and carbon dioxide production.

*P<0.05 and **P<0.01 vs. normal group, †P<0.05 and ††P<0.01 vs. mild group.