**Supplementary Table 1: International Classification of Diseases 9 (ICD-9) codes used for classifying outcomes and comorbidities**

|  |  |
| --- | --- |
| **Medical condition** | **ICD-9 codes** |
| **Outcome** |  |
| VA/SCD | 427.01,427.40-427.59 |
| **Comorbidities** |  |
| Peripheral vascular disease | 250.7 |
| Ischemic stroke | 433.01,433.11,433.21,433.31, 433.81, 433.91, 434.01, 434.11, 435, 436 |
| Atrial fibrillation | 427.31, 429.4 |
| Heart failure | 428.00-428.99 |
| Prior VA/SCD | 427.01,427.40-427.59 |
| Intracranial hemorrhage | 430,431,432.0,432.1,432.9,852.0-852.1,852.2-852.3,852.4-852.5,853.0 |
| Coronary heart disease | 410.0-411.9,413.0-414.9 |
| Hypertension | 401.9 |
| Chronic Obstructive Pulmonary Disease | 491.00-492.99 |
| Cardiomyopathy | 425.0-425.9 |
| Valvular disease | 424.0-424.4 |

VA/SCD: Ventricular arrhythmia or sudden cardiac death

**Supplementary Figure 1: Covariate balance before and after propensity score matching**



VA/SCD: Ventricular arrhythmia or sudden cardiac death; DPP4: dipeptidyl-peptidase 4; GLP-1: glucagon-like peptide 1.

**Supplementary Table 2: Baseline characteristics of metformin and sulfonylurea users stratified by insulin versus insulin nonusers after 1:1 propensity score matching.**

|  |  |  |
| --- | --- | --- |
| **Characteristics** | **Insulin users** | **Insulin nonusers** |
| **Metformin (N=863)** | **Sulfonylurea (N=919)** | **Metformin (N=4,893)** | **Sulfonylurea (N=4,837)** |
| ***Demographics*** |
| Male , N (%) | 472 (54.7%)  | 522 (56.8%)  | 2290 (46.8%)  | 2371 (49.0%)  |
| Baseline age, years | 70.28±10.01 | 70.63±10.37 | 67.92±10.55 | 69.26±10.92 |
| Follow up duration since type 2 diabetes diagnosis, years |  5.14±2.53 |  5.12±2.54 | 5.02±2.57 | 5.02±2.54 |
| ***Comorbidities*** |
| Peripheral vascular disease, N (%) | 10 (1.2%)  | 9 (1.0%)  | 0 (0.0%) | 0 (0.0%) |
| Ischemic stroke, N (%) | 58 (6.7%)  | 89 (9.7%)  | 253 (5.2%)  | 268 (5.5%)  |
| Atrial fibrillation, N (%) | 60 (7.0%)  | 92 (10.0%)  | 201 (4.1%)  | 245 (5.1%)  |
| Heart failure, N (%) | 99 (11.5%)  | 170 (18.5%)  | 192 (3.9%)  | 267 (5.5%)  |
| Prior VA/SCD, N (%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| Intracranial hemorrhage, N (%) | 14 (1.6%)  | 22 (2.4%)  | 82 (1.7%)  | 83 (1.7%)  |
| Coronary heart disease, N (%) | 169 (19.6%)  | 222 (24.2%)  | 669 (13.7%)  | 745 (15.4%)  |
| Hypertension, N (%) | 447 (51.8%)  | 555 (60.4%)  | 1812 (37.0%)  | 1893 (39.1%)  |
| Chronic obstructive pulmonary disease, N (%) | 4 (0.5%)  | 7 (0.8%)  | 18 (0.4%)  | 14 (0.3%)  |
| ***Medications*** |
| ACE inhibitors, N (%) | 638 (73.9%)  | 589 (64.1%)  | 2449 (50.1%)  | 2592 (53.6%)  |
| Beta blockers, N (%) | 365 (42.3%)  | 469 (51.0%)  | 2115 (43.2%)  | 2009 (41.5%)  |
| Calcium channel blockers, N (%) | 477 (55.3%)  | 573 (62.4%)  | 2219 (45.4%)  | 2234 (46.2%)  |
| Diuretics, N (%) | 326 (37.8%)  | 443 (48.2%)  | 1045 (21.4%)  | 1088 (22.5%)  |
| Thiazolidinediones, N (%) | 47 (5.4%)  | 21 (2.3%)  | 27 (0.6%)  | 71 (1.5%)  |
| DPP4 inhibitors, N (%) | 1 (0.1%)  | 0 (0.0%) | 0 (0.0%)  | 1 (0.0%)  |
| GLP-1 agonists, N (%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| ***Laboratory tests*** |
| Cholesterol, mmol/L | 4.64±1.02 | 4.75±1.25 | 4.84±0.95 | 4.78±1.06 |
| High density lipoprotein, mmol/L | 1.18±0.34 | 1.12±0.36 | 1.21±0.31 | 1.21±0.36 |
| Low density lipoprotein, mmol/L | 2.76±0.86 | 2.82±0.98 | 2.94±0.87 | 2.92±0.92 |
| Triglyceride, mmol/L | 1.69±1.24 | 1.86±2.03 | 1.71±1.09 | 1.63±1.31 |
| HbA1c, % | 7.42±1.43 | 7.45±1.39 | 7.46±1.44 | 7.44±1.43 |

Continuous variables were expressed as mean ± standard deviation. SMD <0.1 / VR >0.5 & <2.0indicated good balance in matching. SMD: Standardized mean difference; VR: Variance Ratio; VA/SCD: Ventricular arrhythmia or sudden cardiac death DPP4: dipeptidyl-peptidase 4; GLP-1: glucagon-like peptide 1.

**Supplementary Table 3: Baseline characteristics of metformin and sulfonylurea users stratified by history of coronary heart disease (CHD) after 1:1 propensity score matching.**

|  |  |  |
| --- | --- | --- |
| **Characteristics** | **With CHD** | **Without CHD** |
| **Metformin (N=838)** | **Sulfonylurea (N=967)** | **Metformin (N=4,918)** | **Sulfonylurea (N=4,789)** |
| ***Demographics*** |
| Male , N (%) | 446 (53.2%)  | 515 (53.3%)  | 2316 (47.1%)  | 2378 (49.7%)  |
| Baseline age, years | 71.35±9.72 | 72.72±9.35 | 67.75±10.54 | 68.82±11.01 |
| Follow up duration since type 2 diabetes diagnosis, years | 5.15±2.56 | 5.18±2.57 | 5.02±2.57 | 5.01±2.54 |
| ***Comorbidities*** |
| Peripheral vascular disease, N (%) | 1 (0.1%) | 4 (0.4%)  | 9 (0.2%)  | 5 (0.1%)  |
| Ischemic stroke, N (%) | 64 (7.6%)  | 66 (6.8%)  | 247 (5.0%)  | 291 (6.1%)  |
| Atrial fibrillation, N (%) | 88 (10.5%)  | 105 (10.9%)  | 173 (3.5%)  | 232 (4.8%)  |
| Heart failure, N (%) | 117 (14.0%)  | 224 (23.2%)  | 174 (3.5%)  | 213 (4.4%)  |
| Prior VA/SCD, N (%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| Intracranial hemorrhage, N (%) | 22 (2.6%)  | 22 (2.3%)  | 74 (1.5%)  | 83 (1.7%)  |
| Hypertension, N (%) | 554 (66.1%)  | 631 (65.3%)  | 1705 (34.7%)  | 1817 (37.9%)  |
| Chronic obstructive pulmonary disease, N (%) | 1 (0.1%)  | 8 (0.8%)  | 21 (0.4%)  | 13 (0.3%)  |
| ***Medications*** |
| ACE inhibitors, N (%) | 547 (65.3%)  | 631 (65.3%)  | 2540 (51.6%)  | 2550 (53.2%)  |
| Beta blockers, N (%) | 608 (72.6%)  | 665 (68.8%)  | 1872 (38.1%)  | 1813 (37.9%)  |
| Calcium channel blockers, N (%) | 424 (50.6%)  | 524 (54.2%)  | 2272 (46.2%)  | 2283 (47.7%)  |
| Diuretics, N (%) | 249 (29.7%)  | 378 (39.1%)  | 1122 (22.8%)  | 1153 (24.1%)  |
| Insulin, N (%) | 169 (20.2%)  | 222 (23.0%)  | 694 (14.1%)  | 697 (14.6%)  |
| Thiazolidinediones, N (%) | 3 (0.4%)  | 15 (1.6%)  | 71 (1.4%)  | 77 (1.6%)  |
| DPP4 inhibitors, N (%) | 0 (0.0%)  | 1 (0.1%)  | 1 (0.0%)  | 0 (0.0%)  |
| GLP-1 agonists, N (%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| ***Laboratory tests*** |
| Cholesterol, mmol/L | 4.35±0.88 | 4.46±1.14 | 4.89±0.95 | 4.84±1.07 |
| High density lipoprotein, mmol/L | 1.17±0.31 | 1.13±0.32 | 1.21±0.31 | 1.21±0.37 |
| Low density lipoprotein, mmol/L | 2.59±0.82 | 2.72±0.98 | 2.97±0.87 | 2.95±0.92 |
| Triglyceride, mmol/L | 1.64±0.92 | 1.70±1.30 | 1.72±1.14 | 1.66±1.48 |
| HbA1c, % | 7.41±1.42 | 7.49±1.50 | 7.46±1.45 | 7.43±1.41 |

Continuous variables were expressed as mean ± standard deviation. SMD <0.1 / VR >0.5 & <2.0indicated good balance in matching. SMD: Standardized mean difference; VR: Variance Ratio; VA/SCD: Ventricular arrhythmia or sudden cardiac death; DPP4: dipeptidyl-peptidase 4; GLP-1: glucagon-like peptide 1.

**Supplementary Table 4: Baseline characteristics of individual sulfonylurea users after 1:1 propensity score matching.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Characteristics** | **Glicazide****(N=3411)** | **Glipizide****(N=138)** | **Tolbutamide****(N=115)** | **Glibenclamide****(N=467)** | **Glimepiride****(N=39)** |
| ***Demographics*** |
| Male , N (%) | 1680 (49.3%)  | 67 (48.6%)  | 70 (60.9%)  | 234 (50.1%)  | 18 (46.2%)  |
| Baseline age, years | 69.87±11.00 | 70.51±11.09 | 72.44±11.27 | 67.87±9.51 | 68.03±10.37 |
| Follow up duration since type 2 diabetes diagnosis, years | 5.03±2.53 | 5.17±2.49 | 5.02±2.60 | 5.12±2.68 | 4.93±2.41 |
| ***Comorbidities*** |
| Peripheral vascular disease, N (%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| Ischemic stroke, N (%) | 220 (6.4%)  | 10 (7.2%)  | 8 (7.0%)  | 15 (3.2%)  | 3 (7.7%)  |
| Atrial fibrillation, N (%) | 206 (6.0%)  | 6 (4.3%)  | 9 (7.8%)  | 11 (2.4%)  | 1 (2.6%)  |
| Heart failure, N (%) | 228 (6.7%)  | 7 (5.1%)  | 13 (11.3%)  | 13 (2.8%)  | 4 (10.3%)  |
| Prior VA/SCD, N (%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| Intracranial hemorrhage, N (%) | 64 (1.9%)  | 3 (2.2%)  | 5 (4.3%)  | 5 (1.1%)  | 1 (2.6%)  |
| Coronary heart disease, N (%) | 539 (15.8%)  | 28 (20.3%)  | 25 (21.7%)  | 58 (12.4%)  | 4 (10.3%)  |
| Hypertension, N (%) | 1393 (40.8%)  | 67 (48.6%)  | 73 (63.5%)  | 129 (27.6%)  | 17 (43.6%)  |
| Chronic obstructive pulmonary disease, N (%) | 11 (0.3)  | 1 (0.7%)  | 0 (0.0%) | 2 (0.4%)  | 0 (0.0%) |
| ***Medications*** |
| ACE inhibitors, N (%) | 1838 (53.9%)  | 85 (61.6%)  | 69 (60.0%)  | 230 (49.3%)  | 24 (61.5%) |
| Beta blockers, N (%) | 1416 (41.5%)  | 68 (49.3%)  | 68 (59.1%)  | 162 (34.7%)  | 19 (48.7%)  |
| Calcium channel blockers, N (%) | 1629 (47.8%)  | 73 (52.9%)  | 85 (73.9%)  | 185 (39.6%)  | 23 (59.0%)  |
| Diuretics, N (%) | 834 (24.5%)  | 39 (28.3%)  | 51 (44.3%)  | 68 (14.6%)  | 10 (25.6%)  |
| Insulin, N (%) | 169 (5.0%)  | 10 (7.2%)  | 12 (10.4%)  | 7 (1.5%)  | 6 (15.4%)  |
| Thiazolidinediones, N (%) | 47 (1.4%)  | 7 (5.1%)  | 1 (0.9%)  | 3 (0.6%)  | 5 (12.8%)  |
| DPP4 inhibitors, N (%) | 0 (0.0%)  | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| GLP-1 agonists, N (%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| ***Laboratory tests*** |
| Cholesterol, mmol/L |  4.73±1.05 | 4.80±1.13 | 4.83±1.20 | 4.99±1.06 | 4.75±1.07 |
| High density lipoprotein, mmol/L |  1.21±0.36 | 1.23±0.39 | 1.09±0.28 | 1.24±0.37 | 1.22±0.39 |
| Low density lipoprotein, mmol/L |  2.89±0.91 | 2.73±0.97 | 2.97±1.27 | 3.10±0.89 | 2.98±0.85 |
| Triglyceride, mmol/L |  1.62±1.36 | 1.85±1.45 | 1.85±1.51 | 1.61±1.08 | 1.78±1.13 |
| HbA1c, % |  7.43±1.44 | 7.37±1.36 | 7.67±1.56 | 7.37±1.34 | 7.33±1.33 |

VA/SCD: Ventricular arrhythmia or sudden cardiac death; DPP4: dipeptidyl-peptidase 4; GLP-1: glucagon-like peptide 1.