**Supplementary Table 1a: Deyo’s modification of Charlson’s comorbidity scoring system (CCI).**

|  |  |  |
| --- | --- | --- |
| 412 | Previous Myocardial infarction | 1 |
| 428 – 428.9 | Congestive heart failure | 1 |
| 433.9, 441 – 441.9, 785.4 V43.4 | Peripheral vascular disease | 1 |
| V1254, 438\* | Previous Cerebrovascular disease | 1 |
| 290 – 290.9 | Dementia | 1 |
| 490 – 496, 500 –505, 506.4 | Chronic pulmonary disease | 1 |
| 710.0, 710.1, 710.4, 714 – 714.2, 714.81, 725 | Rheumatologic disease | 1 |
| 531 – 534.9 | Peptic ulcer | 1 |
| 571.2, 571.5, 571.6, 571.4 –571.49 | Mild liver disease | 1 |
| 250 – 250.3, 250.7 | Diabetes | 1 |
| 250.4 – 250.6 | Diabetes with chronic complications | 2 |
| 344.1, 342 – 342.9 | Hemiplegia or paraplegia | 2 |
| 582 – 582.9, 583 – 583.7, 585, 586, 588 – 588.9 | Renal Disease | 2 |
| 140 – 172.9, 174 –195.8, 200 – 208.9 | Any malignancy including leukaemia and lymphoma | 2 |
| 572.2 – 572.8 | Moderate or severe liver disease | 3 |
| 196 – 199.1 | Metastatic solid tumour | 6 |
| 042 – 044.9 | AIDS | 6 |

**Supplementary Table 1b: Van Walraven Elixhauser comorbidity weighting scoring system.**

|  |  |
| --- | --- |
| Elixhauser comorbidity | Points |
| Congestive heart failure | 7 |
| Valvular disease | -1 |
| Pulmonary circulation Disorders | 4 |
| Peripheral vascular disorders | 2 |
| Hypertension (combine uncomplicated and complicated) | 0 |
| Paralysis | 7 |
| Other neurological disorders | 6 |
| Chronic pulmonary disease | 3 |
| Diabetes uncomplicated | 0 |
| Diabetes with chronic complications | 0 |
| Hypothyroidism | 0 |
| Renal failure | 5 |
| Liver disease | 11 |
| Peptic ulcer disease excluding bleeding | 0 |
| AIDS/HIV | 0 |
| Lymphoma | 9 |
| Metastatic cancer | 12 |
| Solid tumor without metastasis | 4 |
| Rheumatoid arthritis / collagen vasculardiseases | 0 |
| Coagulopathy | 3 |
| Obesity | -4 |
| Weight loss | 6 |
| Fluid and electrolyte disorders | 5 |
| Chronic Blood loss anemia | -2 |
| Deficiency anemia | -2 |
| Alcohol abuse | 0 |
| Drug abuse | -7 |
| Psychoses | 0 |
| Depression | -3 |

**Supplementary Table 2: ICD-9-CM codes used for other conditions, procedures and complications.**

|  |
| --- |
| Comorbidities |
| Smoking | V15.82, 305.1 |
| Atrial Fibrillation | 427.31 |
| Long-term use of anticoagulants | V58.61 |
| History of disease or procedure: |
| Previous PCI | V45.82 |
| Prior CABG | V45.81 |
| Treatments/Procedural Characteristics |
| PCI | 00.66, 36.01, 36.02, 36.05, 36.06, 36.07, 36.34 |
| Coronary Angiography | 88.53, 88.54, 88.55, 88.56, 88.57, 37.22, 37.23 |
| Thrombolysis | V45.88, 99.10 |
| CABG | 361\*, 36.31, 36.32, 369\*, 36.33 |
| IABP use | 37.61 |
| Clinical outcomes/Complications: |
| Cardiac complications | 37.0, 423.0, 423.3, 414.12 |
| Acute ischemic Stroke | 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91, 435.0-1, 435.8-9, 436 |
| Vascular complications | 998.2, 999.2, 447, 868.04, 999.739.31, 39.41, 39.49, 39.52, 39.53, 39.56 - 39.59 39.79 |
| Major Bleeding | CSS153, 430, 431, 432.x, 568.81, 998.1x |

ICD-9-CM: International Classification of Diseases, Ninth Edition, Clinical Modification; CCS: Clinical Classification Software; PCI: percutaneous coronary intervention; CABG: coronary artery bypass graft; IABP: intra-aortic balloon pump.

**Supplementary Table 3a: Odds ratio (OR) with 95% confident internal (CI) from sensitivity analysis.**

|  |
| --- |
| **Model 9: Model 5 +** $CCI^{2}$ **+** $CCI^{3}$ |
| **DIED** |
|   | OR | p-value | 95% CI |
| CCI | 1.231325 | 0.000 | 1.20706 1.256077 |
| $CCI^{2}$  | 0.9784524 | 0.000 | .9726581 .9842813 |
| $$CCI^{3}$$ | 1.001146 | 0.000 | 1.000707 1.001584 |
| **BLEEDING** |
|   | OR | p-value | 95% CI |
| CCI | 1.166486 | 0.000 | 1.138985 1.194651 |
| $CCI^{2}$  | 0.9970926 | 0.460 | .9894174 1.004827 |
| $$CCI^{3}$$ | 0.9995032 | 0.115 | .9988858 1.000121 |
| **MACCE** |
|   | OR | p-value | 95% CI |
| CCI | 1.176141 | 0.000 |  1.155585 1.197064 |
| $CCI^{2}$  | 0.9945756 | 0.047 | .9892405 .9999396 |
| $$CCI^{3}$$ | 0.9998878 | 0.589 | .9994802 1.000295 |
| **Model 11: Model 7 +** $ECS^{2}$ **+** $ECS^{3}$ |
| **DIED** |
|   | OR | p-value | 95% CI |
| ECS | 1.138519 | 0.000 | 1.132894 1.144172 |
| $$ECS^{2}$$ | 0.9967743 | 0.000 | .9961921 .9973568 |
| $$ECS^{3}$$ | 1.000017 | 0.066 | .9999989 1.000035 |
| **BLEEDING** |
|   | OR | p-value | 95% CI |
| ECS | 1.037139 | 0.000 | 1.033664 1.040625 |
| $$ECS^{2}$$ | 1.003329 | 0.000 | 1.002872 1.003786 |
| $$ECS^{3}$$ | 0.9998895 | 0.000 |  .9998727 .9999063 |
| **MACCE** |
|   | OR | p-value | 95% CI |
| ECS | 1.102883 | 0.000 | 1.098941 1.106839 |
| $$ECS^{2}$$ | 1.000072 | 0.750 | .9996287 1.000515 |
| $$ECS^{3}$$ | 0.9999463 | 0.000 | .9999318 .9999608 |

ECS: Elixhauser comorbidity score; CCI: Charlson comorbidity index; MACCE: major acute cardiovascular and cerebrovascular events: composite of death, cardiac complications, stroke, and vascular complications.

**Supplementary Table 3b: C-statistics with 95% confident internal (CI) from sensitivity analysis.**

|  |  |
| --- | --- |
| Models\* | Different adverse Outcomes |
| **Death** | **Bleeding** | **MACCE** |
| **C-statistic** | **95% CI** | **C-statistic** | **95% CI** | **C-statistic** | **95% CI** |
| Model 5: Model 3 + continuous CCI. | 0.8217 | (0.8204, 0.8230) | 0.6474 | (0.6454, 0.6493) | 0.7554 | (0.7539, 0.7568) |
| Model 8: Model 5 + $CCI^{2}$ | 0.8219 | (0.8206, 0.8233) | 0.6928 | (0.6911, 0.6946) | 0.8204 | (0.8191, 0.8218) |
| Model 9: Model 5 + $CCI^{2}$+ $CCI^{3}$ | 0.8220 | (0.8207, 0.8233) | 0.6926 | (0.6909, 0.6944) | 0.8204 | (0.8192, 0.8217) |
| Model 7: Model 3 + continuous ECS. | 0.8373 | (0.8360, 0.8385) | 0.6593 | (0.6573, 0.6612) | 0.7755 | (0.7741, 0.7769) |
| Model 10: Model 7 + $ECS^{2}$ | 0.8379 | (0.8367, 0.8392) | 0.7059 | (0.7044, 0.7074) | 0.7758 | (0.7744, 0.7772) |
| Model 11: Model 7 + $ECS^{2}$ + $ECS^{3}$ | 0.8379 | (0.8367, 0.8392) | 0.7058 | (0.7043, 0.7074) | 0.7759 | (0.7746, 0.7773) |

ECS: Elixhauser comorbidity score; CCI: Charlson comorbidity index; MACCE: major acute cardiovascular and cerebrovascular events: composite of death, cardiac complications, stroke, and vascular complications.

\*95% CIs that crossed each other indicated there was not a statistically significant difference between the discrimination of the models being compared.

**Supplementary Table 3c: AIC and BIC for Model goodness-of-fit** **from sensitivity analysis.**

|  |  |
| --- | --- |
| Models\* | Different adverse Outcomes |
| **Death** | **Bleeding** | **MACCE** |
| **AIC** | **BIC** | **AIC** | **BIC** | **AIC** | **BIC** |
| Model 5: Model 3 + continuous CCI. | 523778.1 | 524159.7 | 557332.0 | 557690.0 | 732444.5 | 732814.6 |
| Model 8: Model 5 + $CCI^{2}$ | 523668.3 | 524061.8 | 557189.9 | 557559.4 | 732302.9 | 732684.8 |
| Model 9: Model 5 + $CCI^{2}$+ $CCI^{3}$ | 523643.3 | 524048.9 | 557189.2 | 557570.1 | 732304.8 | 732698.7 |
| Model 7: Model 3 + continuous ECS. | 512097.7 | 512482.6 | 553964.3 | 554323.4 | 715848.6 | 716223.9 |
| Model 10: Model 7 + $ECS^{2}$ | 510954.8 | 511351.7 | 553948.5 | 554319.6 | 715333.1 | 715720.4 |
| Model 11: Model 7 + $ECS^{2}$ + $ECS^{3}$ | 510952.9 | 511361.2 | 553693.5 | 554075.9 | 715261.2 | 715659.8 |

ECS: Elixhauser comorbidity score; CCI: Charlson comorbidity index; MACCE: major acute cardiovascular and cerebrovascular events: composite of death, cardiac complications, stroke, and vascular complications.

\*A difference in AIC or BIC between models of < 2, 4-7, and >10 was interpreted as no, weak, and strong evidence of improved model fit, respectively.

**Supplementary Table 4: C-statistics with 95% confident internal (CI) from logistic regression models without interventions in predicting in-hospital outcomes.**

|  |  |
| --- | --- |
| Models\* | Different adverse Outcomes |
| **Death** | **Bleeding** | **MACCE** |
| **C-statistic** | **95% CI** | **C-statistic** | **95% CI** | **C-statistic** | **95% CI** |
| Model 1: Patient’s demographics. | 0.6915 | (0.6896, 0.6932) | 0.5840 | (0.5820, 0.5861) | 0.6497 | (0.6481, 0.6513) |
| Model 2: Model 1 + clinical risk factors. | 0.7518 | (0.7502, 0.7534) | 0.6189 | (0.6169, 0.6209) | 0.7053 | (0.7038, 0.7067) |
| Model 2-1: Model 2 + categorical CCI. | 0.7636 | (0.7621, 0.7651) | 0.6266 | (0.6246, 0.6285) | 0.7160 | (0.7145, 0.7175) |
| Model 2-2: Model 2 + continuous CCI. | 0.7633 | (0.7617, 0.7648) | 0.6271 | (0.6252, 0.6291) | 0.7162 | (0.7147, 0.7176) |
| Model 2-3: Model 2 + categorical ECS. | 0.7921 | (0.7906, 0.7935) | 0.6417 | (0.6401, 0.6436) | 0.7474 | (0.7459, 0.7487) |
| Model 2-3: Model 2 + continuous ECS. | 0.7927 | (0.7912, 0.7942) | 0.6423 | (0.6403, 0.6442) | 0.7483 | (0.7468, 0.7496) |

ECS: Elixhauser comorbidity score; CCI: Charlson comorbidity index; MACCE: major acute cardiovascular and cerebrovascular events: composite of death, cardiac complications, stroke, and vascular complications.

\*95% CIs that crossed each other indicated there was not a statistically significant difference between the discrimination of the models being compared.