Appendix

Supplemental Table S1: International Classification of Diseases (ICD) code for Stroke

|  |  |
| --- | --- |
| **ICD-10-CA code** | **Description** |
| I60\* | Subarachnoid haemorrhage |
| I61\* | Intracerebral haemorrhage |
| I629 | Intracranial haemorrhage (nontraumatic), unspecified |
| I63\* | Cerebral infarction |
| I64\* | Stroke, not specified as haemorrhage or infarction |
| I676 | Non-pyogenic thrombosis of intracranial venous system |
| G08 | Intracranial and intraspinal phlebitis and thrombophlebitis |
| H341 | Central retinal artery occlusion |
| **As diagnosis** | |
| Type M, 1, 2, W, X, Y; or | |
| Type 3, with one of the following as M, 1, 2, Q, X, Y | |
| D683 | Haemorrhagic disorder due to circulating anticoagulants |
| I978 | Other postprocedural disorders of circulatory system, not elsewhere classified |
| O88\* | Obstetric embolism |
| O994\* | Diseases of the circulatory system complicating pregnancy, childbirth, and the puerperium |
| T810 | Haemorrhage and haematoma complicating a procedure, not elsewhere classified |
| T817 | Vascular complications following a procedure, not elsewhere classified |
| T8188 | Other complications of procedures, not elsewhere classified |

Supplemental Table S2: List of examined predictors of inpatient rehabilitation length of stay in Alberta, 2014-2016

|  |  |
| --- | --- |
| **Variables** | |
| Continuous variables | Age, Year of admission, Admission FIM score, Acute care length of stay of the acute stroke, BMI at admission |
| Binary/categorical variables | Individual patient comorbidity (as listed in Table 1), Stroke position, Stroke type (Ischemic/Hemorrhagic/Other), Having a previous stroke (Yes/No), Living location (Rural/Urban), Living setting prior to admission (Home/ Other), Receiving informal support prior to admission required (Yes/No), Median household income (at forward sortation level, 4 categories as in Table 1), Health zone (Calgary, Edmonton, and Other), Rehabilitation facility (10 facilities). |

Supplemental Table S3: Additional characteristics of studied population

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Whole cohort** | **Modelling cohort**  **(FY2014-2016)** | **Validation cohort**  **(FY2017)** | **p** |
| Admission, N | 2,686 | 2,043 | 643 |  |
| Stroke type |  |  |  |  |
| Ischemic stroke | 2,128 (79.2) | 1,620 (79.3) | 508 (79) | 0.976 |
| Hemorrhagic stroke | 448 (16.7) | 339 (16.6) | 109 (17) |  |
| Other | 110 (4.1) | 84 (4.1) | 26 (4) |  |
| Acute care LOS of the acute stroke episode, in days, mean (SD) | 24.8 (30.2) | 25.8 (30.4) | 21.5 (29.1) | 0.001 |
| Acute care LOS of the acute stroke episode, in days, median (IQR) | 13 (6-32) | 14 (6-33) | 10 (5-26) | <0.001 |
| Informal support received prior to admission, n (%) | 1,536 (57.2) | 1,166 (57.1) | 370 (57.5) | 0.834 |
| Living setting prior to admission, n (%) |  |  |  |  |
| Home | 2,531 (94.2) | 1,917 (93.8) | 614 (95.5) | 0.116 |
| Not home | 155 (5.8) | 126 (6.2) | 29 (4.5) |  |
| Health zone |  |  |  |  |
| Calgary | 1,193 (44.4) | 906 (44.4) | 287 (44.6) | 0.707 |
| Edmonton | 739 (27.5) | 556 (27.2) | 183 (28.5) |  |
| Other | 754 (28.1) | 581 (28.4) | 173 (26.9) |  |
| Inpatient Rehabilitation (IPR) facility |  |  |  |  |
| IPR 01 | 871 (32.4) | 645 (31.6) | 226 (35.2) | 0.002 |
| IPR 02 | 13 (0.5) | 4 (0.2) | 9 (1.4) |  |
| IPR 03 | 322 (12) | 261 (12.8) | 61 (9.5) |  |
| IPR 04 | 736 (27.4) | 553 (27.1) | 183 (28.5) |  |
| IPR 05 | 71 (2.6) | 53 (2.6) | 18 (2.8) |  |
| IPR 06 | 3 (0.1) | 3 (0.2) | 0 (0) |  |
| IPR 07 | 344 (12.8) | 265 (13) | 79 (12.3) |  |
| IPR 08 | 194 (7.2) | 151 (7.4) | 43 (6.7) |  |
| IPR 09 | 45 (1.7) | 34 (1.7) | 11 (1.7) |  |
| IPR 10 | 87 (3.2) | 74 (3.6) | 13 (2) |  |

LOS: length of stay; IQR: interquartile range; SD: standard deviation

Supplemental Table S4: Characteristics of studied population by discharge destination in Alberta, 2014-2017

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Whole cohort** | **Home discharge** | **Other discharge** | **p** |
| Admission, N (%) | 2,526 | 1,901 (75.3) | 625 (24.7) |  |
| Females, n (%) | 1,035 (41) | 743 (39.1) | 292 (46.7) | 0.001 |
| Age, in years, mean (SD) | 67.2 (13.8) | 66 (13.4) | 71 (14.3) | <0.001 |
| Age, in years, median (IQR) | 68 (58-78) | 67 (58-76) | 74 (61-82) | <0.001 |
| Age group, n (%) |  |  |  |  |
| 18-59 years | 708 (28) | 568 (30) | 140 (22.4) | <0.001 |
| 60-69 years | 644 (25.5) | 536 (28.2) | 108 (17.3) |  |
| 70-79 years | 663 (26.3) | 494 (26) | 169 (27) |  |
| ≥80 years | 511 (20.2) | 303 (15.9) | 208 (33.3) |  |
| Urban living location, n (%) | 2,105 (83.3) | 1,604 (84.4) | 501 (80.2) | 0.014 |
| Household income (in $), n (%) |  |  |  |  |
| 0-40,000 | 117 (4.6) | 78 (4.1) | 39 (6.2) | 0.003 |
| 40,000-60,000 | 320 (12.7) | 235 (12.4) | 85 (13.6) |  |
| 60,000-80,000 | 465 (18.4) | 356 (18.7) | 109 (17.4) |  |
| 80,000-100,000 | 569 (22.5) | 405 (21.3) | 164 (26.2) |  |
| >100,000 | 1,055 (41.8) | 827 (43.5) | 228 (36.5) |  |
| Comorbidities, n (%) |  |  |  |  |
| Myocardial infarction | 302 (12) | 212 (11.2) | 90 (14.4) | 0.030 |
| Heart failure | 221 (8.8) | 147 (7.7) | 74 (11.8) | 0.002 |
| Peripheral vascular disease | 187 (7.4) | 141 (7.4) | 46 (7.4) | 0.962 |
| Hypertension | 2,045 (81) | 1,527 (80.3) | 518 (82.9) | 0.158 |
| Atrial fibrillation | 588 (23.3) | 400 (21) | 188 (30.1) | <0.001 |
| Dyslipidemia | 998 (39.5) | 758 (39.9) | 240 (38.4) | 0.513 |
| Dementia | 68 (2.7) | 35 (1.8) | 33 (5.3) | <0.001 |
| Chronic pulmonary disease | 350 (13.9) | 250 (13.2) | 100 (16) | 0.074 |
| Rheumatoid disease | 48 (1.9) | 38 (2) | 10 (1.6) | 0.526 |
| Peptic ulcer | 45 (1.8) | 30 (1.6) | 15 (2.4) | 0.178 |
| Liver disease | 38 (1.5) | 22 (1.2) | 16 (2.6) | 0.012 |
| Diabetes | 810 (32.1) | 627 (33) | 183 (29.3) | 0.085 |
| Renal disease | 182 (7.2) | 128 (6.7) | 54 (8.6) | 0.110 |
| Cancer | 199 (7.9) | 146 (7.7) | 53 (8.5) | 0.520 |
| Metastatic cancer | 28 (1.1) | 19 (1) | 9 (1.4) | 0.361 |
| Rehabilitation LOS, day, median (IQR) | 45 (31-76) | 42 (29-61) | 78 (44-131) | <0.001 |
| Rehabilitation LOS, day, mean (SD) | 65.6 (65.1) | 51.3 (40.2) | 109 (98.5) | <0.001 |
| Admission FIM score, mean (SD) | 78 (22.6) | 83.4 (20.5) | 61.6 (20.6) | <0.001 |
| Admission FIM score, median (IQR) | 79 (62-95) | 85 (70-99) | 60 (46-76) | <0.001 |
| Discharge FIM score, mean (SD) | 102.1 (19.7) | 108.1 (14.1) | 82.5 (22.3) | <0.001 |
| Discharge FIM score, median (IQR) | 109 (94-116) | 112 (103-118) | 84 (67-101) | <0.001 |
| History of an acute stroke, n (%) | 31 (1.2) | 24 (1.3) | 7 (1.1) | 0.779 |
| Stroke position, n (%) |  |  |  |  |
| Left body | 1,028 (40.7) | 740 (38.9) | 288 (46.1) | 0.004 |
| Right body | 1,186 (47) | 912 (48) | 274 (43.8) |  |
| Other | 312 (12.4) | 249 (13.1) | 63 (10.1) |  |
| BMI at admission, median (IQR) | 25.9 (22.6-29.8) | 26.1 (22.7-30.1) | 25.4 (22.3-29.2) | 0.017 |
| Stroke type |  |  |  |  |
| Ischemic stroke | 1,994 (78.9) | 1,503 (79.1) | 491 (78.6) | 0.246 |
| Hemorrhagic stroke | 427 (16.9) | 326 (17.2) | 101 (16.2) |  |
| Other | 105 (4.2) | 72 (3.8) | 33 (5.3) |  |
| Acute care LOS of the acute stroke episode, in days, mean (SD) | 24.8 (30.3) | 22.8 (26.7) | 30.8 (38.4) | <0.001 |
| Acute care LOS of the acute stroke episode, in days, median (IQR) | 13 (6-32) | 12 (6-29) | 16 (7-37) | <0.001 |
| Informal support required prior to admission, n (%) | 1,403 (55.5) | 1,009 (53.1) | 394 (63) | <0.001 |
| Pre-stroke living arrangement |  |  |  |  |
| Lived with spouse/family | 1,854 (73.4) | 1,478 (77.8) | 376 (60.2) | <0.001 |
| Live alone | 672 (26.6) | 423 (22.3) | 249 (39.8) |  |
| Health zone |  |  |  |  |
| Calgary | 1,134 (44.9) | 885 (46.6) | 249 (39.8) | <0.001 |
| Edmonton | 716 (28.4) | 567 (29.8) | 149 (23.8) |  |
| Other | 676 (26.8) | 449 (23.6) | 227 (36.3) |  |
| Rehabilitation facility |  |  |  |  |
| IPR 01 | 816 (32.3) | 617 (32.5) | 199 (31.8) | <0.001 |
| IPR 02 | 11 (0.4) | 7 (0.4) | 4 (0.6) |  |
| IPR 03 | 318 (12.6) | 268 (14.1) | 50 (8) |  |
| IPR 04 | 715 (28.3) | 566 (30) | 149 (23.8) |  |
| IPR 05 | 63 (2.5) | 43 (2.3) | 20 (3.2) |  |
| IPR 06 | 1 (0) | 1 (0.1) | 0 (0) |  |
| IPR 07 | 312 (12.4) | 192 (10.1) | 120 (19.2) |  |
| IPR 06 | 170 (6.7) | 120 (6.3) | 50 (8) |  |
| IPR 09 | 44 (1.7) | 31 (1.6) | 13 (2.1) |  |
| IPR 10 | 76 (3) | 56 (3) | 20 (3.2) |  |

IQR: interquartile range; SD: standard deviation

Supplemental Table S5: Predictors of inpatient rehabilitation length of stay in Alberta, 2014-2016, using negative binomial regression model (N=2,043)

|  |  |  |
| --- | --- | --- |
| **Variables** | **IRR (95% CI)** | **p** |
| Age | 0.991 (0.989- 0.994) | <0.001 |
| Year of admission | 0.963 (0.928- 0.998) | 0.039 |
| Living location  Rural (ref)  Urban | 1.0  1.145 (1.057- 1.240) | 0.001 |
| Acute care length of stay of the acute stroke | 1.004 (1.003- 1.005) | <0.001 |
| Admission FIM score | 0.982 (0.981- 0.984) | <0.001 |
| Comorbidity |  |  |
| Renal disease | 0.905 (0.827- 0.991) | 0.031 |
| Health zone |  |  |
| Calgary (ref) | 1.0 |  |
| Edmonton | 0.413 (0.248- 0.689) | 0.001 |
| Other | 0.947 (0.883- 1.075) | 0.400 |
| Rehabilitation facility |  |  |
| IPR 01 | 1.0 |  |
| IPR 02 | 0.268 (0.072- 0.993) | 0.049 |
| IPR 03 | 0.790 (0.698- 0.894) | <0.001 |
| IPR 04 | 2.364 (1.413- 3.954) | 0.001 |
| IPR 05 | 0.721 (0.582- 0.894) | 0.003 |
| IPR 06 | 1.0 |  |
| IPR 07 | 1.066 (0.905- 1.255) | 0.446 |
| IPR 06 | 0.840 (0.732- 0.963) | 0.013 |
| IPR 09 | 3.126 (2.468- 3.959) | <0.001 |
| IPR 10 | 1.0 |  |

\*IRR calculation was omitted due to few observations or collinearity.

Supplemental Table S6: Predictors of inpatient rehabilitation length of stay in Alberta, 2014-2016, using quantile regression model (N=2,043)

|  |  |  |
| --- | --- | --- |
| **Variables** | **Coefficient (95% CI)** | **p** |
| Age | -0.206 (-0.316; -0.097) | <0.001 |
| Fiscal year | -2.073 (-3.673; -0.474) | 0.011 |
| Receiving informal support prior admission | -3.753 (-7.119; -0.387) | 0.029 |
| Acute length of stay of the acute care stroke | 0.373 (0.318; 0.429) | <0.001 |
| Admission FIM score | -0.705 (-0.766; -0.644) | <0.001 |
| Comorbidity |  |  |
| Peptic ulcer disease | -11.823 (-21.361; -2.285) | 0.015 |
| Health zone |  |  |
| Calgary (ref) | -- |  |
| Edmonton | -40.767 (-74.821; -6.713) | 0.019 |
| Other | -0.320 (-7.670; 7.030) | 0.932 |
| Rehabilitation facility |  |  |
| IPR 01 | -- |  |
| IPR 02 | -37.148 (-67.273; -7.022) | 0.016 |
| IPR 03 | -15.809 (-21.584; 10.034) | <0.001 |
| IPR 04 | 36.866 (2.770; 70.962) | 0.034 |
| IPR 05 | -17.178 (-28.010; -6.345) | 0.002 |
| IPR 06 | -- |  |
| IPR 07 | -8.457 (-16.230; -0.484) | 0.038 |
| IPR 06 | -3.609 (-12.043; 4.825) | 0.401 |
| IPR 09 | 156.785 (144.331; 169.239) | <0.001 |
| IPR 10 | -- |  |

\*Coefficient calculation was omitted due to few observations or collinearity.

Supplemental Table S7: Predictors of inpatient rehabilitation length of stay in Alberta using multiple linear regression model with a randomly selected patient cohort (cohort R1; N=1,343)

|  |  |  |
| --- | --- | --- |
| **Variables** | **Coefficient (95% CI)** | **p** |
| Age | -0.006 (-0.009; -0.004) | <0.001 |
| Fiscal year | -0.010 (-0.039; 0.019) | 0.482 |
| Living location  Rural (ref)  Urban | --  0.105 (0.014; 0.197) | 0.024 |
| Acute length of stay of the acute care stroke | 0.004 (0.003; 0.005) | <0.001 |
| Admission FIM score | -0.017 (-0.018; -0.015) | <0.001 |
| Health zone |  |  |
| Calgary (ref) | -- |  |
| Edmonton | -0.816 (-1.658; 0.026) | 0.058 |
| Other | -0.151 (-0.336; 0.034) | 0.109 |
| IPR facility |  |  |
| IPR 01 (ref) | -- |  |
| IPR 02 | -0.851 (-1.332; -0.371) | 0.001 |
| IPR 03 | -0.227 (-0.373; -0.080) | 0.002 |
| IPR 04 | 0.765 (-0.079; 1.609) | 0.076 |
| IPR 05 | -0.315 (-0.603; -0.027) | 0.032 |
| IPR 06\* | -- |  |
| IPR 07 | 0.109 (-0.084; 0.302) | 0.268 |
| IPR 08 | -0.084 (-0.288; 0.121) | 0.423 |
| IPR 09 | 1.338 (1.028; 1.648) | <0.001 |
| IPR 10\* | -- |  |
| Intercept | 26.392 (-31.984; 84.769) | 0.375 |

\*Coefficient calculation was omitted due to few observations or collinearity. Adjusted R2=38%.

Supplemental Table S8: Predictors of home discharge in Alberta, using multivariable logistic regression model with a randomly selected sample (cohort R1, N=1,263)

|  |  |  |
| --- | --- | --- |
| **Variables** | **OR (95% CI)** | **p** |
| Age | 0.96 (0.95; 0.98) | <0.001 |
| Rehabilitation LOS | 0.98 (0.98; 0.99) | <0.001 |
| Admission FIM score | 1.04 (1.03; 1.05) | <0.001 |
| Informal support required | 0.45 (0.30; 0.68) | <0.001 |
| Pre-stroke living arrangement |  |  |
| With spouse/family (ref) | 1.0 |  |
| Alone | 0.37 (0.25; 0.53) | <0.001 |
| Household income (in $), n, (%) |  |  |
| >100,000 (ref) | 1.0 |  |
| 0-40,000 | 1.79 (0.76; 4.21) | 0.184 |
| 40,000-60,000 | 0.56 (0.34; 0.95) | 0.032 |
| 60,000-80,000 | 0.92 (0.58; 1.46) | 0.730 |
| 80,000-100,000 | 0.77 (0.49; 1.19) | 0.239 |
| Health zone |  |  |
| Calgary zone (ref) | 1.0 |  |
| Edmonton zone | 0.66 (0.40; 1.08) | 0.095 |
| Other | 0.26 (0.11; 0.66) | 0.004 |
| IPR facility |  |  |
| IPR 01 (ref) | 1.0 |  |
| IPR 02 | 0.88 (0.06; 13.34) | 0.928 |
| IPR 03 | 0.67 (0.33; 1.38) | 0.278 |
| IPR 04\* | 1.0 |  |
| IPR 05 | 2.26 (0.56; 9.09) | 0.250 |
| IPR 06\* | 1.0 |  |
| IPR 07 | 1.26 (0.48; 3.31) | 0.637 |
| IPR 08 | 1.08 (0.40; 2.97) | 0.876 |
| IPR 09 | 5.49 (0.97; 30.93) | 0.053 |
| IPR 10\* | 1.0 |  |
| Intercept | 35.24 (8.30; 149.60) | <0.001 |

\*Coefficient calculation was omitted due to few observations or collinearity. Pseudo R2=32.1%. ROC=86.4%