**SUPPLEMENTAL MATERIAL**

**Using Electronic Medical Records of Nursing Care to Characterize Constipation in Patients with Intracerebral Hemorrhage**

**Supplemental Tables**

Table S1. Characteristics of included and excluded patients.

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**Table S1.** Characteristics of included and excluded patients.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Characteristic | Included (n=1748) | Excluded (n=964) | Standardized difference | *P* value |
| Age | 58.3±14.3 | 59.3±14.0 | 0.069 | 0.153 |
| Male sex | 1169 (66.9%) | 666 (69.1%) | 0.047 | 0.239 |
| Admission GCS score |  |  | 0.687 | <0.001 |
| ≤8 | 539 (30.8%) | 610 (63.3%) |  |  |
| >8 | 1209 (69.2%) | 354 (36.7%) |  |  |
| Lifestyle risk factors |  |  |  |  |
| Current smoking | 530 (30.3%) | 273 (28.3%) | 0.044 | 0.275 |
| Alcohol use | 240 (13.7%) | 133 (13.8%) | 0.002 | 0.961 |
| Comorbidities |  |  |  |  |
| Hypertension | 1335 (76.4%) | 679 (70.4%) | 0.135 | <0.001 |
| Diabetes mellitus | 166 (9.5%) | 84 (8.7%) | 0.027 | 0.500 |
| Chronic kidney disease | 81 (4.6%) | 43 (4.5%) | 0.008 | 0.836 |
| Physical examinations |  |  |  |  |
| Temperature, ℃ | 36.6 (36.5-36.8) | 36.7 (36.5-37.0) | 0.290 | <0.001 |
| Heart rate, beats/min | 80.0 (72.0-90.0) | 82.0 (75.0-98.0) | 0.245 | <0.001 |
| Respiratory rate, beats/min | 20.0 (20.0-20.5) | 20.0 (20.0-22.0) | 0.203 | <0.001 |
| Systolic BP, mmHg | 168.0 (146.0-187.0) | 172.0 (150.0-199.0) | 0.172 | <0.001 |
| Laboratory parameters |  |  |  |  |
| Glucose, mmol/L | 7.67 (6.50-9.52) | 8.83 (7.09-11.45) | 0.373 | <0.001 |
| Potassium, mmol/L | 3.76 (3.47-4.04) | 3.76 (3.46-4.13) | 0.134 | 0.290 |
| Sodium, mmol/L | 138.7 (136.3-140.6) | 138.6 (136.0-140.6) | 0.060 | 0.204 |
| Calcium, mmol/L | 2.14 (2.04-2.24) | 2.15 (2.04-2.23) | 0.050 | 0.381 |
| Hemoglobin, g/L |  |  |  |  |
| Male | 144.0 (134.0-155.0) | 145.0 (133.8-157.0) | 0.006 | 0.572 |
| Female | 128.0 (119.2-138.0) | 129.0 (120.0-138.0) | 0.101 | 0.432 |
| Hematoma locations |  |  |  |  |
| Basal ganglia | 805 (46.1%) | 462 (47.9%) | 0.038 | 0.349 |
| Lobar | 426 (24.4%) | 216 (22.4%) | 0.046 | 0.249 |
| Thalamus | 347 (19.9%) | 193 (20.0%) | 0.004 | 0.916 |
| Cerebellum | 156 (8.9%) | 56 (5.8%) | 0.119 | 0.004 |
| Brainstem | 165 (9.4%) | 197 (20.4%) | 0.312 | <0.001 |
| Presence of IVH | 443 (25.3%) | 304 (31.5%) | 0.138 | <0.001 |
| Presence of SAH | 58 (3.3%) | 75 (7.8%) | 0.196 | <0.001 |
| Hematoma volume | 20.1 (7.9-45.0) | 28.2 (10.0-68.8) | 0.345 | <0.001 |
| Hematoma evacuation | 575 (32.9%) | 178 (18.5%) | 0.335 | <0.001 |
| Enteral nutrition | 688 (39.4%) | 220 (22.8%) | 0.363 | <0.001 |
| Mannitol dose, g/day | 124.3 (85.2-160.0) | 112.6 (75.0-175.0) | 0.174 | 0.600 |
| Drugs |  |  |  |  |
| Sedation | 753 (43.1%) | 304 (31.5%) | 0.240 | <0.001 |
| Opioid analgesics | 637 (36.4%) | 193 (20.0%) | 0.371 | <0.001 |
| Vasopressors | 531 (30.4%) | 333 (34.5%) | 0.089 | 0.026 |
| Mechanical ventilation | 656 (37.5%) | 422 (43.8%) | 0.127 | <0.001 |
| Length of stay, days | 174 (10.0%) | 316 (32.8%) | 0.227 | <0.001 |
| In-hospital mortality | 408 (23.3%) | 140 (14.5%) | 0.580 | <0.001 |

GCS, Glasgow Coma Scale; SAH, subarachnoid hemorrhage; BP, blood pressure; IVH, intraventricular hemorrhage. Data are presented as N (%), mean ± SD (standard deviation) and median [interquartile range], as appropriate. Hematoma could involve more than one site.

**Table S2.** Characteristics of study population, stratified by admission GCS score.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Characteristic | Admission GCS score ≤ 8 | | |  | Admission GCS score > 8 | | |
| Non-constipation (n=350) | Constipation (n=189) | *P* value |  | Non-constipation (n=990) | Constipation (n=219) | *P* value |
| Age | 57.9±14.7 | 58.3±14.3 | 0.725 |  | 58.6±14.2 | 57.7±14.4 | 0.311 |
| Male sex | 132 (37.7%) | 63 (33.3%) | 0.312 |  | 326 (32.9%) | 58 (26.5%) | 0.064 |
| Chronic kidney disease | 25 (7.1%) | 14 (7.4%) | 0.910 |  | 28 (2.8%) | 14 (6.4%) | 0.009 |
| Laboratory parameters |  |  |  |  |  |  |  |
| Glucose, mmol/L | 8.80 (7.39-11.12) | 8.91 (7.67-11.39) | 0.469 |  | 7.22 (6.26-8.62) | 7.53 (6.37-8.89) | 0.112 |
| Calcium, mmol/L | 2.14 (2.01-2.25) | 2.09 (1.98-2.19) | 0.027 |  | 2.15 (2.06-2.24) | 2.14 (2.03-2.23) | 0.106 |
| Hematoma locations |  |  |  |  |  |  |  |
| Basal ganglia | 163 (46.6%) | 100 (52.9%) | 0.160 |  | 431 (43.5%) | 111 (50.7%) | 0.054 |
| Cerebellum | 18 (5.1%) | 21 (11.1%) | 0.011 |  | 91 (9.2%) | 26 (11.9%) | 0.225 |
| Hematoma volume | 33.4 (12.1-59.6) | 46.3 (19.8-79.1) | 0.191 |  | 14.1 (6.0-33.0) | 26.6 (9.2-47.8) | <0.001 |
| Hematoma evacuation | 134 (38.3%) | 129 (68.3%) | <0.001 |  | 212 (21.4%) | 100 (45.7%) | <0.001 |
| Enteral nutrition | 190 (54.3%) | 175 (92.6%) | <0.001 |  | 196 (19.8%) | 127 (58.0%) | <0.001 |
| Mannitol dose, g/day | 152.0 (100.0-166.6) | 134.6 (100.0-162.6) | 0.191 |  | 106.2 (83.4-156.2) | 128.2 (86.7-159.3) | 0.034 |
| Drugs |  |  |  |  |  |  |  |
| Sedation | 203 (58.0%) | 160 (84.7%) | <0.001 |  | 260 (26.3%) | 130 (59.4%) | <0.001 |
| Opioid analgesics | 90 (25.7%) | 98 (51.9%) | <0.001 |  | 339 (34.2%) | 110 (50.2%) | <0.001 |
| Vasopressors | 159 (45.4%) | 132 (69.8%) | <0.001 |  | 153 (15.5%) | 87 (39.7%) | <0.001 |
| Mechanical ventilation | 197 (56.3%) | 175 (92.6%) | <0.001 |  | 162 (16.4%) | 122 (55.7%) | <0.001 |
| Pulmonary infection | 133 (38.0%) | 117 (61.9%) | <0.001 |  | 140 (14.1%) | 79 (36.1%) | <0.001 |
| Length of stay, days | 10.0 (6.0-15.0) | 15.0 (10.0-21.0) | <0.001 |  | 7.0 (5.0-10.0) | 12.0 (8.0-18.0) | <0.001 |
| In-hospital mortality | 73 (20.9%) | 38 (20.1%) | 0.016 |  | 46 (4.6%) | 17 (7.8%) | 0.060 |

GCS, Glasgow Coma Scale. Data are presented as N (%), mean ± SD (standard deviation) and median [interquartile range], as appropriate.

**Table S3.** Characteristics of study population, stratified by length of stay.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Characteristic | Length of stay ≤ 7 days | | |  | Length of stay > 7 days | | |
| Non-constipation (n=676) | Constipation (n=71) | P value |  | Non-constipation (n=664) | Constipation (n=337) | *P* value |
| Age | 59.0±13.9 | 61.3±15.9 | 0.188 |  | 57.9±14.7 | 57.3±13.9 | 0.455 |
| Male sex | 458 (67.8%) | 51 (71.8%) | 0.483 |  | 424 (63.9%) | 236 (70.0%) | 0.051 |
| Admission GCS score |  |  | <0.001 |  |  |  | <0.001 |
| ≤8 | 124 (18.3%) | 25 (35.2%) |  |  | 226 (34.0%) | 164 (48.7%) |  |
| >8 | 552 (81.7%) | 46 (64.8%) |  |  | 438 (66.0%) | 173 (51.3%) |  |
| Chronic kidney disease | 24 (3.6%) | 4 (5.6%) | 0.379 |  | 29 (4.4%) | 24 (7.1%) | 0.066 |
| Laboratory parameters |  |  |  |  |  |  |  |
| Glucose, mmol/L | 7.28 (6.26-8.83) | 8.04 (6.91-11.05) | 0.004 |  | 7.93 (6.68-9.81) | 8.13 (6.85-10.04) | 0.293 |
| Calcium, mmol/L | 2.16 (2.08-2.25) | 2.08 (2.00-2.18) | 0.004 |  | 2.13 (2.01-2.23) | 2.12 (2.01-2.22) | 0.248 |
| Hematoma locations |  |  |  |  |  |  |  |
| Basal ganglia | 317 (46.9%) | 39 (54.9%) | 0.197 |  | 277 (41.7%) | 172 (51.0%) | 0.005 |
| Cerebellum | 60 (8.9%) | 10 (14.1%) | 0.152 |  | 49 (7.4%) | 37 (11.0%) | 0.055 |
| Hematoma volume | 13.3 (5.7-30.5) | 20.5 (8.2-49.6) | 0.003 |  | 24.8 (9.8-47.2) | 36.7 (14.7-61.9) | <0.001 |
| Hematoma evacuation | 103 (15.2%) | 30 (42.3%) | <0.001 |  | 243 (36.6%) | 199 (59.1%) | <0.001 |
| Enteral nutrition | 81 (12.0%) | 33 (46.5%) | <0.001 |  | 305 (45.9%) | 269 (79.8%) | <0.001 |
| Mannitol dose, g/day | 100.0 (83.4-160.0) | 150.0 (89.8-175.0) | 0.010 |  | 139.2 (86.2-159.0) | 130.0 (95.0-158.4) | 0.646 |
| Drugs |  |  |  |  |  |  |  |
| Sedation | 147 (21.7%) | 41 (57.7%) | <0.001 |  | 316 (47.6%) | 249 (73.9%) | <0.001 |
| Opioid analgesics | 196 (29.0%) | 29 (40.8%) | 0.038 |  | 233 (35.1%) | 179 (53.1%) | <0.001 |
| Vasopressors | 108 (16.0%) | 29 (40.8%) | <0.001 |  | 204 (30.7%) | 190 (56.4%) | <0.001 |
| Mechanical ventilation | 111 (16.4%) | 37 (52.1%) | <0.001 |  | 248 (37.3%) | 260 (77.2%) | <0.001 |
| Pulmonary infection | 61 (9.0%) | 16 (22.5%) | <0.001 |  | 212 (31.9%) | 180 (53.4%) | <0.001 |
| In-hospital mortality | 69 (10.2%) | 14 (19.7%) | 0.015 |  | 50 (7.5%) | 41 (12.2%) | 0.016 |

GCS, Glasgow Coma Scale. Data are presented as N (%), mean ± SD (standard deviation) and median [interquartile range], as appropriate.

**Table S4.** The information of time sequence for therapeutic measures. a

|  |  |  |  |
| --- | --- | --- | --- |
| Therapeutic measure | Available time sequence compared to constipation occurring, n (%) | Before constipation occurring, n (%) | After constipation occurring, n (%) |
| Enteral nutrition | 302 (17.3%) | 259 (85.8%) | 43 (14.2%) |
| Sedation | 290 (16.6%) | 273 (94.1%) | 17 (5.9%) |
| Opioid analgesics | 208 (11.9%) | 190 (91.3%) | 18 (8.7%) |
| Vasopressors | 219 (12.5% | 179 (81.7%) | 40 (18.3%) |
| Mechanical ventilation | 297 (17.0%) | 288 (97.0%) | 9 (3.0%) |

a Patients received therapeutic measure after constipation occurring were excluded in the univariate and multivariate analysis of factors associated with constipation.

**Table S5.** Univariate and multivariate analysis of factors associated with constipation, stratified by length of stay.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Unadjusted model | |  | Adjusted Model 1 a | |  | Adjusted Model 2 b | |
| OR (95% CI) | *P* value |  | OR (95% CI) | *P* value |  | OR (95% CI) | *P* value |
| **Length of stay ≤ 7 days** | | | | | | | | |
| Admission GCS score | 0.41 (0.24-0.70) | 0.001 |  | 0.41 (0.24-0.69) | 0.001 |  | 0.33 (0.14-0.78) | 0.011 |
| Hematoma evacuation | 4.07 (2.43-6.82) | <0.001 |  | 4.70 (2.75-8.04)) | <0.001 |  | 4.17 (1.60-10.90) | 0.004 |
| Use of enteral nutrition | 6.38 (3.79-10.74) | <0.001 |  | 6.17 (3.63-10.51) | <0.001 |  | 5.35 (2.19-13.07) | 0.001 |
| Use of sedation | 4.92 (2.97-8.15) | <0.001 |  | 5.04 (3.02-8.43) | <0.001 |  | 3.41 (1.30-8.94) | 0.012 |
| Use of opioid analgesics | 1.69 (1.02-2.79) | 0.040 |  | 1.74 (1.05-2.88) | 0.031 |  | 2.55 (1.17-5.56) | 0.018 |
| Use of vasopressors | 3.63 (2.17-6.08) | <0.001 |  | 3.53 (2.10-5.93) | <0.001 |  | 1.85 (0.74-4.64) | 0.187 |
| Use of mechanical ventilation | 5.54 (3.33-9.21) | <0.001 |  | 5.45 (3.27-9.09) | <0.001 |  | 6.38 (2.06-19.82) | 0.001 |
| **Length of stay > 7 days** | | | | | | | | |
| Admission GCS score | 0.54 (0.42-0.71) | <0.001 |  | 0.53 (0.41-0.69) | <0.001 |  | 0.60 (0.41-0.87) | 0.007 |
| Hematoma evacuation | 2.50 (1.91-3.27) | <0.001 |  | 2.51 (1.91-3.29) | <0.001 |  | 1.82 (1.16-2.84) | 0.009 |
| Use of enteral nutrition | 4.66 (3.43-6.33) | <0.001 |  | 3.73 (2.70-5.16) | <0.001 |  | 2.13 (1.31-3.45) | 0.002 |
| Use of sedation | 3.12 (2.34-4.15) | <0.001 |  | 2.57 (1.91-3.46) | <0.001 |  | 1.43 (0.90-2.28) | 0.130 |
| Use of opioid analgesics | 2.10 (1.60-2.74) | <0.001 |  | 1.94 (1.47-2.56) | <0.001 |  | 1.63 (1.11-2.40) | 0.014 |
| Use of vasopressors | 2.91 (2.22-3.82) | <0.001 |  | 2.49 (1.88-3.30) | <0.001 |  | 1.78 (1.19-2.66) | 0.005 |
| Use of mechanical ventilation | 5.66 (4.20-7.64) | <0.001 |  | 4.71 (3.46-6.41) | <0.001 |  | 3.28 (1.97-5.46) | <0.001 |

CI, confidence interval; GCS, Glasgow Coma Scale; OR, odds ratio. a Model 1 adjusted for age and sex; b Model 2 adjusted for age, sex, diabetes mellitus, chronic kidney disease, systolic blood pressure, blood glucose level, sodium level, calcium level, basal ganglia hemorrhage, cerebellar hemorrhage, mannitol dose, hematoma volume, hematoma evacuation and admission Glasgow Coma Scale score except the stratification factor itself.