Supplementary material

Supplementary Table 1. Severe illness code of 28 disease groups.

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| --- | --- | --- |
| No. | KCD-7 disease code | Disease groups |
| 1 | I210-I219 | Acute myocardial infarction |
| 2 | I6300-I64 | Acute stroke |
| 3 | I610-I629 | Intracranial hemorrhage |
| 4 | I600-I609 | Subarachnoid hemorrhage |
| 5 | ICISS\_2015 ≤0.90 | Major trauma |
| 6 | I7101-I7109, I7110-I7119, I713, I715, I718 | Aortic dissection |
| 7 | K8000-K8011, K8030-K8041, K8051, K810, K819, K830, K831 | Hepatobiliary diseases |
| 8 | K352-K353, K631, K650-K659, K661 | Surgical diseases |
| 9 | I8500-I8501, I864, I983, K920-K922, K226, K2500, K2540, K2501, K2521, K2541, K2561, K260, K262, K264, K266, T181 | Gastrointestinal bleeding/foreign bodies |
| 10 | R042, R048, R049, T1740-T1799 | Tracheobronchial bleeding/foreign bodies |
| 11 | T360-T659 | Intoxication (including CO poisoning) |
| 12 | O000-O009, O140-O159, O4200, O4201, O4209, O4210, O4211, O4219, O4220, O4221, O4229, O4290, O4291, O4299, O450-O459, O6000-O6039, O800-O809, O820-O829, O720-O723, O622 | Peripartum diseases |
| 13 | P0700-P0739, P220-P229, P240-P249, P360-P369, P520-P529, P590-P599 | Preterm/low birth weight |
| 14 | T3130-T3199, T2030-T2039, T2070-T2079, T213, T217 | Major burn |
| 15 | G410-G419 | Status epilepticus |
| 16 | A830-A879, G000-G07 | Meningitis |
| 17 | A021, A227, A241, A267, A400-A409, A410-A414, A419, A427, B007, B377 | Sepsis |
| 18 | E1000-E1018, E1100-E1118, E1300-E1318, E1400-E1418 | Diabetic coma |
| 19 | I260, I269, I802 | PTE/DVT |
| 20 | I441, I442, I450-I459, I472, I480-I489, I490, I495, I498, I499 | Arrhythmia |
| 21 | J80, J81, J850-J869, J9600-J9699 | ARDS/pneumonia/pulmonary edema |
| 22 | D65 | DIC |
| 23 | K561-K563, K565-K566 | Intussusception/intestinal obstruction |
| 24 | S480-S489, S580-S589, S6800-S689, S780-S789, S880-S889, S980-S984, T050-T059, T060-T068, T116, T136 | Amputation |
| 25 | N170-N179 | Acute kidney injury |
| 26 | H3300-H3309, H3310-H332, H3330-H334, H3350-H3358, H340-H349, H400, H4010-H4019, H4020-H403, H404, H405, H406, H4080-H409, H420, H428 | Ophthalmic emergencies |
| 27 | I460-I469 | Post resuscitation status |
| 28 | N44, N4500-N4502, N4590-N4592 | Urological emergencies |

KCD: Korean Standard Classification of Diseases; CO: carbon monoxide; PTE: pulmonary thromboembolism; DVT: deep vein thrombosis; ARDS: acute respiratory distress syndrome; DIC: disseminated intravascular coagulation.

Supplementary Table 2. The RI and CI values for severe emergency patients in the 70 intermediate medical service districts.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No | Region | RI (%) | CI (%) | No. of Cluster | No | Region | RI (%) | CI (%) | No. of Cluster |
| 1 | Seoul northwest | 67.2 | 45.6 | 2 | 36 | Gangneung | 89.7 | 44.2 | 2 |
| 2 | Seoul northeast | 68.1 | 72.7 | 2 | 37 | Donghae | 45.2 | 86.9 | 1 |
| 3 | Seoul southwest | 64.0 | 64.8 | 2 | 38 | Sokcho | 41.1 | 81.7 | 1 |
| 4 | Seoul southeast | 67.0 | 49.7 | 2 | 39 | Cheongju | 81.3 | 79.4 | 2 |
| 5 | Busan west | 18.0 | 63.4 | 1 | 40 | Chungju | 46.0 | 82.5 | 1 |
| 6 | Central Busan | 78.1 | 49.0 | 2 | 41 | Jecheon | 59.8 | 78.0 | 2 |
| 7 | Busan east | 44.8 | 62.4 | 1 | 42 | Cheonan | 85.8 | 60.7 | 2 |
| 8 | Daegu northeast | 63.7 | 55.8 | 2 | 43 | Gongju | 13.7 | 75.2 | 1 |
| 9 | Daegu Southwest | 78.8 | 49.6 | 2 | 44 | Seosan | 56.2 | 83.4 | 2 |
| 10 | Incheon northwest | 62.5 | 60.2 | 2 | 45 | Nonsan | 35.6 | 85.4 | 1 |
| 11 | Incheon northeast | 58.0 | 70.9 | 2 | 46 | Hongseong | 28.6 | 85.5 | 1 |
| 12 | Central Incheon | 60.5 | 60.1 | 2 | 47 | Jeongju | 84.7 | 69.4 | 2 |
| 13 | South Incheon | 55.7 | 55.1 | 2 | 48 | Gunsan, | 53.6 | 74.2 | 2 |
| 14 | Gwangju gwangseo | 51.9 | 62.6 | 2 | 49 | Iksan | 84.1 | 52.7 | 2 |
| 15 | Gwangju southeast | 78.5 | 40.3 | 2 | 50 | Jeongeup | 37.6 | 93.6 | 1 |
| 16 | Daejeon west | 62.4 | 46.3 | 2 | 51 | Namwon | 20.8 | 82.9 | 1 |
| 17 | Daejeon east | 70.1 | 53.0 | 2 | 52 | Mokpo | 72.4 | 82.2 | 2 |
| 18 | Ulsan southwest | 35.2 | 54.5 | 1 | 53 | Yeosu | 70.0 | 89.7 | 2 |
| 19 | Ulsan northeast | 74.5 | 56.2 | 2 | 54 | Suncheon | 73.1 | 85.5 | 2 |
| 20 | Sejong | 52.1 | 64.8 | 2 | 55 | Naju | 35.4 | 57.2 | 1 |
| 21 | Suwon | 80.0 | 70.5 | 2 | 56 | Haenam | 55.3 | 89.7 | 2 |
| 22 | Seongnam | 71.9 | 74.9 | 2 | 57 | Yeonggwang | 41.5 | 76.4 | 1 |
| 23 | Uijeongbu | 66.2 | 69.4 | 2 | 58 | Pohang | 80.3 | 81.7 | 2 |
| 24 | Anyang | 71.5 | 78.8 | 2 | 59 | Gyeongju | 40.4 | 81.0 | 1 |
| 25 | Bucheon | 62.2 | 49.7 | 2 | 60 | Andong | 76.4 | 58.6 | 2 |
| 26 | Pyeongtaek | 58.3 | 80.5 | 2 | 61 | Gumi | 61.9 | 85.6 | 2 |
| 27 | Ansan | 64.8 | 79.8 | 2 | 62 | Yeongju | 15.9 | 84.7 | 1 |
| 28 | Goyang | 77.6 | 62.0 | 2 | 63 | Sangju | 59.8 | 81.5 | 2 |
| 29 | Namyangju | 57.9 | 74.4 | 2 | 64 | Changwon | 83.2 | 79.7 | 2 |
| 30 | Paju | 1.8 | 77.9 | 1 | 65 | Jinju | 86.6 | 77.9 | 2 |
| 31 | Icheon | 22.2 | 76.8 | 1 | 66 | Tongyeong | 55.6 | 89.0 | 2 |
| 32 | Pocheon | 33.4 | 68.7 | 1 | 67 | Gimhae | 60.9 | 66.5 | 2 |
| 33 | Chuncheon | 83.5 | 77.5 | 2 | 68 | Geochang | 27.0 | 85.1 | 1 |
| 24 | Wonju | 89.8 | 59.5 | 2 | 69 | Jeju | 95.0 | 73.0 | 2 |
| 35 | Yeongwol | 18.7 | 86.2 | 1 | 70 | Seogwipo | 40.4 | 81.4 | 1 |

RI: Relevance index; CI: Commitment index.

Supplementary Table 3. Index in NbClust (26 indicators).

|  |  |  |
| --- | --- | --- |
| No | Index in NbClust | Optimal number of clusters |
| 1 | KL | 2 |
| 2 | CH | 10 |
| 3 | Hartigan | 7 |
| 4 | CCC | 2 |
| 5 | Scott | 3 |
| 6 | Marriot | 7 |
| 7 | TrCovW | 3 |
| 8 | TraceW | 3 |
| 9 | Friedman | 0 |
| 10 | Rubin | 7 |
| 11 | Cindex | 6 |
| 12 | DB | 10 |
| 13 | Silhouette | 2 |
| 14 | Duda | 2 |
| 15 | PseudoT2 | 2 |
| 16 | Beale | 3 |
| 17 | Ratkowsky | 6 |
| 18 | Ball | 2 |
| 19 | PtBiserial | 2 |
| 20 | Frey | 7 |
| 21 | McClain | 0 |
| 22 | Dunn | 2 |
| 23 | Hubert | 0 |
| 24 | SDindex | 10 |
| 25 | Dindex | 0 |
| 26 | SDbw | 10 |