**Supplementary Material**

**Figure S1.** Flowchart of selection of patients, care units, and hospital for analysis

5,452 acute hospitals at the end of Nov 2016

1,986 excluded: 99 or less beds

3,466 hospitals with 100 or more beds

**A set of questionnaires was sent**

1,187 hospitals responded (34.2%)

141 excluded: no patients with dementia

1,046 hospitals responded 29,088 patient questionnaires from 2,676 care units

5,549 excluded

-2,218: hospital questionnaire lacked

- 272: unit questionnaire lacked

- 741: incomplete unit information

-2,115: no sign of cognitive impairment

- 76: aged under 40 years old

- 127: incomplete patient information

23,539 patients from 2,355 units from 937 hospitals

**Included for analysis**

**Table S1.** Comparison in characteristics between the included and the excluded patients

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Included(*n* = 23,539) | Excluded(*n* = 5,549) | Test statistics | P-value |
| Age, year, mean (SD) | 83.1 (9.0) | 77.1 (14.5) | *t* (6383.51) = 28.84 | **<.001\*** |
| Sex, male, n (%) | 10,340 (43.9) | 2,634 (47.7) | *χ2* (1) = 25.76 | **<.001\*** |
| Absence of dementia diagnosis was confirmed, n (%) | 11,269 (47.9) | 3,544 (63.9) | *χ2* (1) = 459.61 | **<.001\*** |
| Delirium, n (%) | 1,015 (4.3) | 100 (1.8) | *χ2* (1) = 76.74 | **<.001\*** |

**\*** Significant at P <.05.

**Table S2.** Comparison in characteristics between the included and the excluded care units

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Included(*n* = 2,355) | Excluded(*n* = 321) | Test statistics | P-value |
| Nurse staffing ratio per 100 inpatients on the survey day, mean (SD) | 24.6 (54.9) | 26.6 (86.2) | *t* (600.15) = 0.48 | .629 |
| Type of care function, n (%) |  |  | *χ2* (1) = 32.83 | **<.001\*** |
| Acute | 1,804 (76.6) | 445 (88.1) |  |  |
| Sub-acute | 551 (23.4) | 60 (11.9) |  |  |
| Type of clinical department, n (%) |  |  |  |  |
| Orthopedic surgery | 524 (22.3) | 116 (20.3) | *χ2* (1) = 1.01 | .316 |
| Rehabilitation | 212 (9.0) | 19 (3.3) | *χ2* (1) = 20.35 | **<.001\*** |
| Neurological surgery | 190 (8.1) | 42 (7.4) | *χ2* (1) = 0.32 | .572 |
| Cardiovascular internal medicine  | 141 (6.0) | 46 (8.1) | *χ2* (1) = 3.29 | .070 |
| Gastroenterological internal medicine  | 128 (5.4) | 32 (5.6) | *χ2* (1) = 0.03 | .873 |
| Respiratory internal medicine | 120 (5.1) | 28 (4.9) | *χ2* (1) = 0.04 | .851 |
| Gastroenterological surgery | 117 (5.0) | 38 (6.7) | *χ2* (1) = 2.61 | .106 |
| Urology | 97 (4.1) | 30 (5.3) | *χ2* (1) = 1.43 | .232 |

**\*** Significant at P <.05.

**Table S3.** Comparison in characteristics between the included and the excluded hospitals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Included(*n* = 937) | Excluded(*n* = 234) | Test statistics | P-value |
| Available team or specialist, n (%) |  |  |  |  |
| Specialized palliative care team | 441 (47.1) | 90 (38.5) | *χ2* (1) = 5.59 | **.018\*** |
| Consultation-liaison psychiatrist | 244 (26.0) | 51 (21.8) | *χ2* (1) = 1.79 | .181 |
| Dementia nurse | 201 (21.5) | 39 (16.7) | *χ2* (1) = 2.63 | .105 |
| Psychiatric mental health nurse | 33 (3.5) | 7 (3.0) | *χ2* (1) = 0.16 | .689 |
| Gerontological nurse | 21 (2.2) | 10 (4.3) | *χ2* (1) = 3.00 | .083 |

**\*** Significant at P <.05.

**Table S4.** Multilevel binomial logistic regression analysis where use of mittens was excluded from the definition of physical restraint

|  |  |  |  |
| --- | --- | --- | --- |
|  | Coefficient (β) | Adjusted odds ratio [95% CI] | P-value |
| Unit certified for dementia care unit | **-0.32** | **0.72 [0.59, 0.88]** | **.001\*** |
| ***Patient characteristic*** |  |  |  |
| Age, year, reference: 95 years and older |  |  |  |
| 40-64 years old | -0.16 | 0.85 [0.67, 1.08] | .182 |
| 65-69 years old | **-0.23** | **0.80 [0.64, 0.99]** | **.045\*** |
| 70-74 years old | **-0.39** | **0.68 [0.56, 0.83]** | **<.001\*** |
| 75-79 years old | **-0.22** | **0.80 [0.67, 0.95]** | **.011\*** |
| 80-84 years old | **-0.18** | **0.83 [0.71, 0.97]** | **.023\*** |
| 85-89 years old | -0.06 | 0.94 [0.81, 1.10] | .465 |
| 90-94 years old | 0.12 | 1.13 [0.96, 1.32] | .149 |
| Sex, male | **0.41** | **1.50 [1.39, 1.62]** | **<.001\*** |
| Absence of dementia diagnosis was confirmed | **-0.80** | **0.45 [0.41, 0.49]** | **<.001\*** |
| ***Unit characteristic*** |  |  |  |
| Nursing staff ratio per patient, reference: < 25th percentile |  |  |  |
| 25-75th percentile | 0.17 | 1.18 [0.92, 1.52] | .199 |
| > 75th percentile | 0.03 | 1.03 [0.75, 1.42] | .848 |
| Type of care function, acute | **0.65** | **1.91 [1.42, 2.56]** | **<.001\*** |
| Type of clinical department |  |  |  |
| Orthopedic surgery | **0.70** | **2.02 [1.58, 2.58]** | **<.001\*** |
| Rehabilitation | **0.50** | **1.65 [1.10, 2.46]** | **.015\*** |
| Neurological surgery | **0.80** | **2.22 [1.56, 3.17]** | **<.001\*** |
| Cardiovascular internal medicine | -0.01 | 0.99 [0.65, 1.50] | .946 |
| Respiratory internal medicine | 0.25 | 1.28 [0.81, 2.01] | .283 |
| Gastroenterological internal medicine | 0.08 | 1.08 [0.69, 1.70] | .722 |
| Gastroenterological surgery | -0.18 | 0.83 [0.51, 1.35] | .456 |
| Urology | -0.09 | 0.91 [0.55, 1.52] | .723 |
| ***Hospital characteristic*** |  |  |  |
| Specialized palliative care team | 0.06 | 1.07 [0.85, 1.34] | .583 |
| Consultation-liaison psychiatrist | **-0.35** | **0.71 [0.56, 0.89]** | **.003\*** |
| Dementia nurse | 0.04 | 1.05 [0.82, 1.33] | .712 |
| Psychiatric mental health nurse | -0.10 | 0.90 [0.57, 1.44] | .673 |
| Gerontological nurse | -0.58 | 0.56 [0.31, 1.02] | .057 |

CI, confidence interval.

**\*** Significant at P <.05.

Multilevel binomial logistic regression analysis, χ2 (26) = 522.89, *p* < .001, random effect (care unit) = 4.49 (95%CI, [4.05, 4.97]). A likelihood-ratio test comparing the model to ordinary logistic regression: χ2(1) = 6424.92, *p* < .001.