Table S1. Antipsychotic Medications Used by Residents with Dementia

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Episode-Level** | | **Person-Level** | |
| **Medication Name** | **n** | **%** | **n** | **%** |
| Any Antipsychotic Medication | 9242 | 100 | 1730 | 100 |
| Typical (First Generation) |  |  |  |  |
| Chlorpromazine | 67 | 0.72 | 26 | 1.50 |
| Haloperidol | 730 | 7.90 | 243 | 14.05 |
| Periciazine | 6 | 0.06 | 5 | 0.29 |
| Trifluoperazine | 7 | 0.08 | 6 | 0.35 |
| Zuclopenthixol | 2 | 0.02 | 1 | 0.06 |
| Atypical (Second Generation) |  |  |  |  |
| Amisulpride | 93 | 1.01 | 16 | 0.92 |
| Aripiprazole | 84 | 0.91 | 11 | 0.64 |
| Clozapine | 20 | 0.22 | 2 | 0.12 |
| Olanzapine | 1743 | 18.86 | 311 | 17.98 |
| Paliperidone | 6 | 0.06 | 2 | 0.12 |
| Quetiapine | 1722 | 18.63 | 383 | 22.14 |
| Risperidone | 5079 | 55.0 | 1053 | 60.87 |

Percentages in the episode-level and person-level column will exceed 100% if added because some residents were taking multiple antipsychotic medications. For Zuclopenthixol we only included oral tablets (i.e. not the moderate and long-acting preparations)

Table S2. Prevalence of Antipsychotic Medication Use Among Residents with Dementia 2014-2017

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **2014** | | **2015** | | **2016** | | **2017** | | **2014-2017** | |
|  | **n** | **Col. %** | **n** | **Col. %** | **n** | **Col. %** | **n** | **Col. %** | **n** | **Col. %** |
| **All Residents** | 6218 |  | 6702 |  | 6669 |  | 5962 |  | 10480 |  |
|  |  |  |  |  |  |  |  |  |  |  |
| **With dementia** | 3433 | 55.21% | 3748 | 55.92% | 3648 | 54.70% | 3239 | 54.33% | 5825 | 55.58% |
|  |  |  |  |  |  |  |  |  |  |  |
| **Residents with dementia with antipsychotic medication use** | 949 | 27.64% | 1135 | 30.28% | 1163 | 31.88% | 1056 | 32.60% | 2202 | 37.80% |

Table S3. Psychiatric Comorbidities by Sex (person-level)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Females (n=1129)** | | **Males (n=601)** | |
|  | **n** | **Col. %** | **n** | **Col. %** |
| **Comorbid psychoses, schizophrenia, paranoid states or bipolar disorder** | 208 | 18.42 | 90 | 14.98 |
| **Depression, mood or affective disorder** | 662 | 58.64 | 300 | 49.92 |
| **Without psychoses, schizophrenia, paranoid states or bipolar disorder** | 519 | 45.97 | 243 | 40.43 |
| **Anxiety or stress-related disorder** | 358 | 31.71 | 119 | 19.80 |
| **Without psychoses, schizophrenia, paranoid states or bipolar disorder** | 294 | 26.04 | 94 | 15.64 |
| **Any of the three mental health and behavioral comorbidity categories** | 806 | 71.39 | 360 | 59.90 |
|  |  |  |  |  |
| **Comorbid psychoses, schizophrenia, paranoid states or bipolar disorder cases by data source** | | | | |
|  | **Psychoses e.g. schizophrenia, paranoid states recorded in ACFI assessment** | **Psychoses e.g. schizophrenia, paranoid states *not* recorded in ACFI assessment** | **Total (row)** |  |
| **Psychoses recorded in EHR notes** | 35 | 34 | 69 |  |
| **Paranoia or paranoid states recorded in EHR notes** | 46 | 48 | 94 |  |
| **Schizophrenia recorded in EHR notes** | 52 | 15 | 67 |  |
| **Bipolar disorder recorded in EHR notes** | 12 | 40 | 52 |  |
| **Psychoses e.g. schizophrenia, paranoid states recorded in ACFI assessment only** | 59 | 0 | 59 |  |

Table S4. Antipsychotic Medication Episode Characteristics

|  |  |  |
| --- | --- | --- |
|  | **Primary episode definition** | |
| **Variable** | **n** | **%** |
| Residents with Dementia who Used Antipsychotic Medication | 1730 | 100% |
| Without comorbid SBD | 1432 | 82.77% |
| With comorbid SBD | 298 | 17.23% |
| With comorbid depression, no SBD | 762 | 44.05% |
| With comorbid anxiety, no SBD | 388 | 22.43% |
| With comorbid SBD, depression or anxiety | 1166 | 67.40% |
| With comorbid SBD, depression and anxiety | 67 | 3.87% |
| Without SBD, depression and anxiety | 564 | 32.60% |
|  |  |  |
| At least one antipsychotic medication use episode > 3 months | 1124 | 64.97% |
| Among residents without comorbid SBD | 894 | 62.43% |
| Among residents with comorbid SBD | 230 | 77.18% |
| Among residents with depression and no SBD | 489 | 64.17% |
| Among residents with anxiety and no SBD | 262 | 67.53% |
| Among residents with SBD, depression or anxiety | 788 | 67.58% |
| Among residents with SBD, depression and anxiety | 55 | 82.09% |
| Among residents with no SBD, depression or anxiety | 336 | 59.57% |
|  |  |  |
| Total number of antipsychotic medication administration episodes | 9242 | 100% |
| Among residents without comorbid SBD | 7168 | 77.56% |
| Among residents with comorbid SBD | 2074 | 22.44% |
| Among residents with depression and no SBD | 3948 | 42.72% |
| Among residents with anxiety and no SBD | 2077 | 22.47% |
| Among residents with SBD, depression or anxiety | 6644 | 71.89% |
| Among residents with SBD, depression and anxiety | 460 | 4.98% |
| Among residents with no SBD, depression or anxiety | 2598 | 28.11% |
|  |  |  |
| Total number of antipsychotic medication administration episodes > 3 months | 1629 | 17.63% |
| Among residents without comorbid SBD | 1280 | 17.86% |
| Among residents with comorbid SBD | 349 | 16.83% |
| Among residents with depression and no SBD | 702 | 17.78% |
| Among residents with anxiety and no SBD | 380 | 18.30% |
| Among residents with SBD, depression or anxiety | 1153 | 17.35% |
| Among residents with SBD, depression and anxiety | 84 | 18.26% |
| Among residents with no SBD, depression or anxiety | 476 | 18.32% |
|  |  |  |
|  | **Min - Max** | **Median (IQR)** |
| Days between episodes | 2-1221 | 3 (2-6) |
| Among residents without comorbid SBD | 2-1221 | 3 (2-7) |
| Among residents with comorbid SBD | 2-643 | 3 (2-6) |
| Among residents with depression and no SBD | 2-1221 | 3 (2-6) |
| Among residents with anxiety and no SBD | 2-1221 | 3 (2-8) |
| Among residents with SBD, depression or anxiety | 2-1221 | 3 (2-6) |
| Among residents with SBD, depression and anxiety | 2-287 | 4 (2-6) |
| Among residents with no SBD, depression or anxiety | 2-782 | 3 (2-6) |

Episode defined as continuous days of administration with no gaps exceeding one day and allows for gaps due to the resident being out of the facility temporarily.

Table S5. Model-Based Estimates of Mean Duration Antipsychotic Medication at Median Ages by Sex and Psychiatric Comorbidities

|  |  |  |
| --- | --- | --- |
|  | **Estimate (95% CI)** | |
|  | **Females** | **Males** |
| **No psychiatric comorbidities** | 197.08 (149.18, 244.98) | 216.24 (157.94, 274.54) |
| **PSBD** | 258.40 (177.17, 339.63) | 180.77 (103.50, 258.04) |
| **Depression without PSBD** | 213.03 (164.11, 261.95) | 221.25 (162.45, 280.06) |
| **Anxiety without PSBD** | 247.89 (180.53, 315.26) | 273.20 (186.16, 360.24) |

1730 residents aged 65+ with dementia observed for 9242 antipsychotic medication administration episodes during 2014-2017. Episodes are defined as continuous use with interruptions not exceeding one day, and interruptions during time outside of the facility are allowed, but not counted as a day of use. PSBD = Psychoses (including paranoid states), Schizophrenia or Bipolar Disorder. Depression represents depression and other mood disorders in the absence of PSBD. Anxiety represents anxiety or other stress-related disorders in the absence of PSBD. Estimates are adjusted for age and age2, and interactions between age (including quadratic term), sex and comorbidity.

Table S6. Multilevel Regression: Marginal Effects for Duration of Antipsychotic Medication Use Sensitivity Analyses

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Independent Variable** | | **Naïve Episode Definition** | | |  | **2-day Gap Definition** | | |
| **Estimate (SE)** | **95% CI** | **P** |  | **Estimate (SE)** | **95% CI** | **P** |
| PSBD | | 33.85 (34.44) | -33.67, 101.36 | 0.33 |  | -47.20 (121.74) | -285.80, 191.40 | 0.70 |
| PSBD\*Male | | 45.42 (59.60) | -71.40, 162.23 | 0.45 |  | 743.67 (802.47) | -829.14, 2,316.48 | 0.35 |
| Age\*PSBD | | -3.95 (2.64) | -9.13, 1.23 | 0.14 |  | 21.22 (14.52) | -7.23, 49.68 | 0.14 |
| Age\*male\*PSBD | | -4.65 (4.21) | -12.91, 3.61 | 0.27 |  | -57.74 (23.04) | -102.90, -12.58 | 0.01 |
| Age2\*PSBD | | 1.09 (0.69) | -0.26, 2.43 | 0.11 |  | -6.88 (3.82) | -14.38, 0.61 | 0.07 |
| Age2\*male\*PSBD | | 0.69 (1.24) | -1.74, 3.13 | 0.58 |  | 17.08 (6.93) | 3.50, 30.67 | 0.01 |
| Depression | | 13.84 (18.33) | -22.09, 49.77 | 0.45 |  | 231.01 (152.83) | -68.53, 530.55 | 0.13 |
| Age\*depression | | -1.50 (1.83) | -5.08, 2.08 | 0.41 |  | -16.51 (10.01) | -36.13, 3.11 | 0.10 |
| Age2\*depression | | 0.30 (0.47) | -0.61, 1.21 | 0.52 |  | 3.81 (2.59) | -1.27, 8.90 | 0.14 |
| Anxiety | | -13.22 (13.79) | -40.26, 13.82 | 0.34 |  | -84.26 (80.30) | -241.65, 73.13 | 0.29 |
| Age\*anxiety | | 3.47 (1.77) | 0.01, 6.93 | 0.05 |  | 13.89 (10.69) | -7.05, 34.84 | 0.19 |
| Age2\*anxiety | | -1.25 (0.49) | -2.21, -0.29 | 0.01 |  | -4.32 (2.84) | -9.89, 1.26 | 0.13 |
| Male | | -15.04 (18.08) | -50.47, 20.39 | 0.41 |  | -167.58 (99.51) | -362.62, 27.47 | 0.09 |
| Age | | 2.22 (1.81) | -1.33, 5.78 | 0.22 |  | 3.07 (9.49) | -15.53, 21.67 | 0.75 |
| Age2 | | -1.10 (0.46) | -1.99, -0.20 | 0.02 |  | -1.53 (2.38) | -6.19, 3.13 | 0.52 |
| Age\*male | | 2.11 (2.12) | -2.03, 6.26 | 0.32 |  | 23.23 (10.71) | 2.24, 44.22 | 0.03 |
| Age2\*male | | -0.48 (0.57) | -1.60, 0.63 | 0.39 |  | -6.04 (2.90) | -11.72, -0.36 | 0.04 |
| English Primary Language | | 8.51 (6.95) | -5.11, 22.13 | 0.22 |  | 23.30 (33.04) | -41.46, 88.07 | 0.48 |
| Marital Status | |  |  |  |  |  |  |  |
| Unknown | | 5.75 (9.25) | -12.39, 23.89 | 0.53 |  | 59.17 (50.26) | -39.34, 157.67 | 0.24 |
| Single | | -1.31 (7.16) | -15.35, 12.73 | 0.85 |  | -19.13 (31.05) | -79.98, 41.72 | 0.54 |
| Widowed | | 10.58 (4.94) | 0.90, 20.27 | 0.03 |  | 29.16 (22.53) | -14.99, 73.31 | 0.20 |
| Divorced | | 8.49 (7.78) | -6.77, 23.74 | 0.28 |  | 83.81 (43.59) | -1.62, 169.25 | 0.06 |
| Separated | | 19.08 (18.70) | -17.58, 55.73 | 0.31 |  | 47.27 (78.71) | -107.00, 201.53 | 0.55 |
| High Care | | -9.79 (5.76) | -21.08, 1.50 | 0.09 |  | -47.51 (27.61) | -101.63, 6.60 | 0.09 |
| Country of Origin | |  |  |  |  |  |  |  |
| Australia | | -7.94 (6.55) | -20.77, 4.89 | 0.23 |  | -2.49 (29.19) | -59.71, 54.73 | 0.93 |
| UK | | -14.12 (6.53) | -26.91, -1.33 | 0.03 |  | -32.48 (32.20) | -95.59, 30.64 | 0.31 |
| China | -14.89 (11.46) | | -37.36, 7.57 | 0.19 |  | -30.08 (55.99) | -139.82, 79.66 | 0.59 |
| Italy | | -20.78 (8.65) | -37.74, -3.83 | 0.02 |  | -113.73 (31.40) | -175.27, -52.18 | <.001 |
| Chronic Comorbidities | |  |  |  |  |  |  |  |
| Cerebrovascular Disease | | -10.10 (3.75) | -17.44, -2.75 | 0.01 |  | -47.90 (17.42) | -82.04, -13.76 | 0.01 |
| Respiratory Disease | | -6.31 (3.76) | -13.68, 1.06 | 0.09 |  | 11.58 (22.55) | -32.61, 55.77 | 0.61 |
| Renal Disease | | -11.16 (4.17) | -19.34, -2.98 | 0.01 |  | -26.23 (21.27) | -67.93, 15.47 | 0.22 |
| Myocardial Infarction | | 8.61 (9.49) | -10.00, 27.22 | 0.36 |  | 10.96 (39.97) | -67.37, 89.30 | 0.78 |
| Liver Disease | | -28.75 (9.61) | -47.58, -9.91 | 0.003 |  | -100.69 (44.05) | -187.03, -14.36 | 0.02 |
| Hypertension | | 3.27 (3.63) | -3.84, 10.38 | 0.37 |  | 21.81 (16.94) | -11.39, 55.00 | 0.20 |
| Heart Disease | | -2.51 (3.65) | -9.66, 4.65 | 0.49 |  | -19.72 (17.88) | -54.76, 15.32 | 0.27 |
| Dyslipidaemia | | -0.47 (4.00) | -8.32, 7.37 | 0.91 |  | 10.80 (19.60) | -27.61, 49.21 | 0.58 |
| Diabetes | | -8.28 (4.08) | -16.28, -0.29 | 0.04 |  | -21.04 (19.33) | -58.93, 16.86 | 0.28 |
| Heart Failure | | -0.89 (6.55) | -13.72, 11.94 | 0.89 |  | -3.04 (31.07) | -63.93, 57.86 | 0.92 |
| Cancer | | -5.52 (4.12) | -13.60, 2.56 | 0.18 |  | -4.34 (20.68) | -44.86, 36.18 | 0.83 |
| Arthritis | | 0.19 (3.07) | -5.83, 6.21 | 0.95 |  | -0.29 (16.20) | -32.05, 31.46 | 0.99 |
| Facility Location | |  |  |  |  |  |  |  |
| Inner Regional | | 12.13 (7.63) | -2.82, 27.07 | 0.11 |  | 43.61 (28.84) | -12.90, 100.13 | 0.13 |
| Outer Regional | | -13.11 (14.84) | -42.20, 15.98 | 0.38 |  | -91.07 (42.30) | -173.97, -8.17 | 0.03 |
| Staff Per Bed | | -0.63 (6.76) | -13.89, 12.63 | 0.93 |  | -2.90 (25.67) | -53.20, 47.40 | 0.91 |
| IRSAD | |  |  |  |  |  |  |  |
| Quintile 2 | | -3.98 (10.09) | -23.75, 15.79 | 0.69 |  | -12.46 (38.40) | -87.71, 62.80 | 0.75 |
| Quintile 3 | | 20.93 (13.36) | -5.26, 47.12 | 0.12 |  | 109.50 (55.41) | 0.89, 218.10 | 0.05 |
| Quintile 4 | | -12.73 (9.86) | -32.07, 6.60 | 0.20 |  | -65.07 (34.63) | -132.93, 2.80 | 0.06 |
| Quintile 5 | | 1.77 (10.28) | -18.38, 21.91 | 0.86 |  | -30.36 (36.81) | -102.51, 41.79 | 0.41 |
| LOS, years | | 6.73 (1.44) | 3.90, 9.55 | <.001 |  | 31.48 (6.85) | 18.06, 44.91 | <.001 |
| LOS, years2 | | -0.15 (0.09) | -0.33, 0.03 | 0.10 |  | -0.93 (0.40) | -1.72, -0.14 | 0.02 |
| Right censored episode | | 125.76 (20.15) | 86.27, 165.25 | <.001 |  | 1,107.89 (193.25) | 729.13, 1,486.65 | <.001 |
| Left censored episode | | 70.03 (10.38) | 49.68, 90.38 | <.001 |  | 595.26 (89.92) | 419.02, 771.50 | <.001 |
| Doubly censored episode | | 36.72 (27.59) | -17.37, 90.80 | 0.18 |  | -164.84 (28.17) | -220.06, -109.62 | <.001 |
| Right censored episode\*PSBD | | -3.58 (8.88) | -20.98, 13.81 | 0.69 |  | -87.30 (33.09) | -152.16, -22.44 | 0.01 |
| Right censored episode\*depression | | 18.49 (10.64) | -2.36, 39.35 | 0.08 |  | -64.40 (32.49) | -128.08, -0.72 | 0.05 |
| Left censored episode\*depression | | -7.75 (6.35) | -20.19, 4.69 | 0.22 |  | -19.16 (33.16) | -84.16, 45.83 | 0.56 |
| Atypical Antipsychotic Used | | 8.14 (4.12) | 0.06, 16.22 | 0.05 |  | 153.11 (14.18) | 125.31, 180.91 | <.001 |

Residents with dementia who used an antipsychotic medication during 2014-2017. PSBD = Psychoses (including paranoid states), Schizophrenia or Bipolar Disorder. Depression represents depression and other mood disorders in the absence of PSBD. Anxiety represents anxiety or other stress-related disorders in the absence of PSBD. Age is scaled to years past age 64. Reference groups are: females, comorbidity not present, other non-English primary language, married, low care, from a country other than Australia, UK, China or Italy, facility located in major city, IRSAD quintile 1, episode not censored, typical antipsychotic used. LOS = length of stay in years. The “naïve” definition of duration does not allow any gaps within episodes (i.e. the episode ends as soon as there is at least a one-day gap or time away in hospital). The 2-day gap definition of duration allows gaps in use of up to 2 days to occur within in an episode (i.e. the episodes ends if there are at least 3 days with out use), and permits time away in hospital (counting resumes once the resident returns).