14-Year Trends in the Use of Psychotropic Medications, Opioids, and Other Sedatives among Institutionalized Older People in Helsinki, Finland

Abstract

*Objectives***:** The use of psychotropic drugs in long-term care (LTC) is very common, despite their known adverse effects. The prevalence of opioid use is growing among older adults. This study aimed to investigate trends in the prevalence of psychotropics, opioids, and sedative load in a LTC setting over a 14-year period. We also explored the interaction of psychotropic and opioid use according to residents' dementia status in nursing home (NH) and assisted living facility (ALF) settings.

*Design***:** Four cross-sectional studies.

Setting: institutional settings in Helsinki, Finland.

Participants: Older residents in NHs in 2003 (n=1987), 2011 (n=1576), and 2017 (n=791) and in ALFs in 2007 (n=1377), 2011 (n=1586), and 2017 (n=1624).

Measures: Comparable assessments were conducted among LTC residents at four time-points over 14 years. The prevalence of regular psychotropics, opioids, and other sedatives and data on demographics and diagnoses were collected from medical records.

Results: Disabilities and severity of dementia increased in both settings over time. The prevalence of all psychotropics decreased significantly in NHs (from 81% in 2003 to 61% in 2017), whereas in ALFs there was no similar linear trend (65% in 2007 and 64% in 2017). There was a significant increase in the prevalence of opioids in both settings, being 30% in NHs and 22% in AFLs in 2017. Residents with dementia used less psychotropics and opioids than those without dementia in both settings and at each time-point.

*Conclusions/Implications***:** NHs show a favorable trend in psychotropic drug use, but the rates of psychotropic use remain high in both NHs and ALFs. In addition, the rates of opioid use have almost tripled, leading to a high sedative load among LTC residents. Clinicians should carefully consider the risk-to-benefit ratio when prescribing in LTC.

Introduction

The use of psychotropic drugs in long-term care (LTC) is very common.[1] In studies published from 2004 to 2017, the prevalence of use of any psychotropic drug has varied between 52% and 80% in nursing homes (NHs)[2-6] and between 53% and 68% in assisted living facilities (ALFs)[7,8] . The prevalence of any psychotropic is higher among LTC residents with dementia than among their peers with normal cognition.[9,10] There have been concerns of the potential adverse effects related to psychotropic medication such as falls and cognitive decline.[11,12] Higher use of healthcare services and greater mortality have also been suggested.[13,14] Psychotropic use has been associated with lower quality of life.[15] Few studies have examined the long-term trends in the use of psychotropics in LTC settings. In NHs of the United States, use of antipsychotics decreased after OBRA 87,[16] whereas the use of antidepressants increased between 1996 and 2006.[17] In 2018 data from the National Partnership Program in the United States showed a significant reduction of antipsychotic use between 2011-2018 being 14.8% nationwide[18]. In Finnish NHs the use of antipsychotics, anxiolytics, and hypnotics decreased between 2003 and 2011.[19] However, less is known about the trends in later years.

The prevalence of opioid use has been growing in the older population,[20] and also in NHs over the years.[19,21] In a recent study, the use of opioids has not decreased from 2007 to 2016 among older people, and their use is highest among disabled Medicaid beneficiaries.[22] High use could be problematic because older adults are prone to falls, cognitive decline, and delirium.[23-25] Concomitant use of psychotropic medications and opioids may results in a high sedative load among vulnerable LTC residents. The aim of this study was to examine trends in prevalence of psychotropic medications and opioids in institutionalized older adults in Helsinki over a 14-year period. We also explored the interaction of psychotropic and opioid use according to residents' dementia status in NH and ALF settings.

Methods

Study participants

This study combined data from four comparable cross-sectional studies exploring medication use and nutrition in institutional settings in Helsinki. The studies were conducted among all NH residents of Helsinki in 2003 (n=1987), 2011 (n=1576), and 2017 (n=791) and among all ALF residents of Helsinki in 2007 (n=1377), 2011 (n=1586), and 2017 (n=1624). All residents aged 65 years and older were invited to participate. The 2003, 2011, and 2017 samples comprised 94%, 81%, and 68% of the total NH population, and the 2007, 2011, and 2017 samples 66%, 64%, and 62% of the total ALF population, respectively. The nonparticipants were those suffering from moderate-severe dementia (CDR 2-3) and not having a close proxy to give informed consent, refusals, or those not providing a complete medication list.

In Finland, ALFs provide round the clock care with a registered nurse in charge. This is similar to the care provided in NHs, but ALFs are designed to resemble residents' own home environment to a greater extent. ALFs include both apartments and group homes for people with dementia. However, the number of registered nurses is lower in ALFs than in traditional NHs. The number of NH beds in Helsinki has significantly declined from 2003 to 2017, and this has been compensated by an increase in the number of ALF beds. The national recommendation for minimum staffing levels in 24-hour care is 0.6 employees per resident in NHs and 0.5 in ALFs.

Measures

All medications were classified using the Anatomical Therapeutic Chemical (ATC) classification system.[26] Psychotropic medications included antipsychotics (N05A), antidepressants (N06A),

anxiolytics (N05B), and hypnotics and sedatives (N05C). Opioids (N02A) were further categorized as weak opioids (codeine, buprenorphine, tramadol) and strong opioids (morphine, fentanyl, oxycodone). The use of paracetamol (N02BE01) and nonsteroidal anti-inflammatory drugs (NSAIDs) (M01A) was also included to illustrate the overall use of pain medication. In addition, we report the use of Alzheimer medication (N06D), including cholinesterase inhibitors (N06DA) and/or memantine (N06DX01), because they are often used for neuropsychiatric symptoms alternatively to psychotropics.[27] In addition to psychotropics and opioids, we defined, for the purpose of the analysis, also other medications that contribute to sedative load, including pregabalin (N03AX16), gabapentin (N03AX12), carbamazepine (N03AF01), oxcarbazepine (N03AF02), and valproic acid (N03AG01). Medication use was considered regular if there was a documented regular sequence of administration. Only regularly used medications were considered when comparing the prevalence at each time-point. Medication use was reported as using/not using. Dosages were not calculated.

Data on medication use, diagnoses, and demographic factors were collected from medical records. The Charlson Comorbidity Index[28] was used to calculate each resident's burden of comorbidity. We trained thoroughly nurses in each setting to collect data and perform the assessments. The nurses used Clinical Dementia Rating (CDR)[29] to grade the severity of dementia and Mini Nutritional Assessment (MNA)[30] to assess and grade each resident's nutritional state. Resident's mobility was assessed by the MNA item and categorized to either 0="unable to get out of a bed, a chair, or a wheelchair without the assistance of another person" or 1="able to get out of bed or a chair without help".

Statistics

Significance for the unadjusted hypothesis of linearity between cohorts was evaluated by using the Cochran-Armitage test for trend or analysis of variance with an appropriate contrast. Number of medications used was calculated using a Poisson regression model and proportion of opioids users was evaluated using a logistic model. The models included gender, age, Charlson comorbidity index, and ability to move independently as covariates. The bootstrap method was used when the theoretical distribution of the test statistics was unknown or in the case of violation of assumptions (e.g. non-normality). The normality of variables was evaluated with the Shapiro-Wilk W-test. All analyses were performed using STATA 15.1 (StataCorp, College Station, TX, USA).

Statement of ethics

The study protocol was approved by the Ethics Committee of the University of Helsinki. Written informed consent was obtained from each participant and in case of significant cognitive decline (CDR 2 or 3) from their closest proxy.

Results

NH and ALF residents were more disabled in their mobility and had more often dementia in the latter cohorts (Tables 1 and 2). The severity of cognitive decline increased over time in both settings according to the CDR memory item. The proportion of males increased over time in both facilities. Mean age, comorbidities, or nutritional status did not change significantly over time.

The prevalence of psychotropic medication use declined significantly in the NHs ($p<0.001$), whereas in ALFs there was no linear trend ($p=0.15$). The prevalence of regular psychotropic medication use in NHs fell from 81.3 % in 2003 to 60.9% in 2017. In ALFs, the prevalence remained more stable, being 64.6% in 2007 and 63.6% in 2017. In NHs, the use of antipsychotic medication dropped from 42.7% to 32.7%, whereas in ALFs the use of antipsychotic medication

increased from 27.3% to 34.0%. Also the use of antidepressants dropped from 44.9% to 32.7% in NHs. In ALFs, the prevalence of antidepressants increased from 39.3% to 46.3% in 2011 and dropped again to 37.5% in 2017. The prevalence of anxiolytic use dropped from 40.9 % to 14.4% in NHs, and in ALFs from 24.1% to 9.6%. The use of hypnotics also decreased significantly in NHs from 11.3% to 6.1%, whereas in ALFs there was a significant increase from 10.2% to 17.2%.

The prevalence of regular opioid use increased linearly in both NHs and ALFs over the years ($p<0.001$). In NHs, the prevalence of regular opioid use increased from 11.7% in 2003 to 30.2% in 2017. In ALFs, the increase was from 8.6% in 2007 to 21.6% in 2017. The largest increase in prevalence was observed in strong opioids in NHs, where the prevalence increased from 1.9% to 14.9%.

The use of NSAIDs decreased significantly in both groups, being minimal in 2017; 0.8% in NHs and 0.5% in ALFs. Paracetamol was widely used and its prevalence increased significantly in NHs from 34.3% in 2003 to 51.6% in 2017, whereas its use in ALFs did not change significantly, being 38.6% in 2017. The prevalence of pregabalin or gabapentin use in NHs increased from 0.6% to 9.1%. In ALFs, the corresponding increase was from 2.2% to 6.9%. The prevalence of Alzheimer medication increased significantly for both groups ($p<0.001$). One in three NH residents and half of ALF residents were administered Alzheimer medication in 2017.

The overall sedative load decreased significantly in NH residents ($p<0.001$), from 84.6% in 2003 to 69.1% in 2017. In ALFs, no significant change occurred in the prevalence of sedative medication.

When the psychotropic users were stratified according to diagnosis of dementia, in NHs both people with and without dementia showed significant decrease in the prevalence of psychotropic use over the 14-year follow-up ($p<0.001$ for cohort), whereas people with dementia used less psychotropics ($p<0.001$ for dementia), and among them the use decreased more rapidly ($p<0.001$ for interaction) (Figure 1a). There was no similar interaction in ALFs ($p<0.001$ for cohort, $p=0.004$ for dementia,

p=0.41 for interaction) (Figure 1a). In NHs the whole cohort showed significant decrease in the use of antipsychotics over the 14-year follow-up (p<0.001 for cohort), whereas people with dementia used less antipsychotics than those without dementia (p=0.026 for dementia). There was no interaction (p=0.060 for interaction) (Figure 1b). In ALFs the use of antipsychotics increased over time and people with dementia used more antipsychotics than those without dementia (p<0.001 for cohort, p<0.001for dementia and p=0.024 for interaction) (Figure 1b). In NHs the whole cohort showed significant decrease in the use of anxiolytics and hypnotics over the 14-year follow-up (p<0.001 for cohort), whereas people with dementia used less anxiolytics and hypnotics (p<0.001 for dementia). There was no interaction among people with and without dementia (p=0.38 for interaction) (Figure 1c). In ALFs the use of anxiolytics and hypnotics also decreased over time and people with dementia used less anxiolytics and hypnotics than those without dementia (p<0.001 for cohort, p<0.001for dementia and p=0.37 for interaction) (Figure 1b). In NHs the whole cohort showed significant decrease in the use of antidepressants over the 14-year follow-up (p<0.001 for cohort). People with dementia used less antidepressants than those without dementia (p<0.001 for dementia). People without dementia showed more rapid decrease in antidepressants that those with dementia (p=0.0015 for interaction) (Figure 1d). In ALFs the use of antidepressants showed an overall trend of increase in the whole cohort (p<0.001 for cohort). People with dementia used less antidepressants than those without dementia (p=0.022 for dementia). There was no interactions (p=0.35 for interaction) (Figure 1d).

When the opioids users in NHs were stratified according to diagnosis of dementia, the whole cohort showed significant increase in the use of opioids over the 14-year period (p<0.001 for cohort). People with dementia used less opioids (p<0.001 for dementia), and the use increased more rapidly among them compared to those without dementia (p<0.001 for interaction) (Figure 2). In ALFs, the residents with dementia used less opioids, but the use increased over time; there was, however, no interaction (p<0.001 for cohort, p<0.001 for dementia, p=0.65 for interaction). In NHs, both groups

showed significant decreases in the prevalence of overall sedative medication use over the 14-year follow-up ($p<0.001$ for dementia, $p<0.001$ for cohort, $p<0.039$ for interaction) (Figure 3). In ALFs, people with dementia used less sedatives ($p<0.001$ for dementia), with the use increasing significantly over time ($p<0.001$), but there was no interaction ($p=0.058$).

Discussion

Our study demonstrated important trends in the use of psychotropic medications and opioids over the past 14 years in LTC in Helsinki. The prevalence of psychotropic medication decreased significantly in NHs, but not in ALFs. There was a considerable increase in the prevalence of opioids in both settings. The changes detected may partly reflect the changes in resident profile: both dementia and mobility disabilities are more prevalent and more severe in latter cohorts and the difference between these two settings has diminished.

An important strength of our study is the large sample size and comparable data at each of the four time-points. Residents were assessed by well-trained nurses in 2003, 2007, 2011, and 2017 using the same data collection instruments and methodology, resulting in high validity of data. Our assessments were cross-sectional. We were not able to follow the same resident at different time-points, because the mean time spent in LCT in Helsinki is less than two years. Another strength of the study is that medication use was taken directly from each resident's medication administration chart, ensuring that only medication actually taken was included in the analysis. Moreover, we only considered medication that was taken regularly. However, it has been shown that psychotropic medication may also be administered on a pro re nata basis, so our results might underestimate the actual use of these medications.[10] Another limitation is that response rates have significantly decreased over the years in NHs. The non-responders are mainly people with moderate-severe dementia and not having a proxy. Thus, the estimates of increases in dementia and disability are

probably underestimates. In addition, the organization of long-term care has changed over time challenging the comparability of NHs. The number of NH beds has significantly decreased whereas the increasing number of beds in ALFs have replaced them. However, all available residents living in Helsinki long-term care were included.

The results of this study are fairly in line with other recent studies examining the growing trend of opioid use in LTC.[31, 21] However, the opioid use in LTC in Helsinki is still lower than among disabled Medicaid beneficiaries in the United States (quarterly use 39%).[21] The increased use of opioids around the world may reflect the overall "opioid epidemic", i.e. the marked rise in opioid use in general populations.[32] On the other hand it has also been noted that pain assessment and management are suboptimal among patients with dementia in NHs.[33] At the end-of-life care the use of opioids and psychotropics is often appropriate.[34] However, according to RAI data on the study population, the number of residents in terminal care is very small (0.6%)[35] and has not significantly increased over time. The use of other painkillers seem to become favourable since the use of NSAIDs has almost disappeared and the use of paracetamol has increased. However, the fairly high concomitant use of gabapentinoids may predispose residents to falls.[36]

While the changes in the use of opioid medications were consistent with other recent studies, the changes in the use of psychotropic medication were found to be more complex. A systematic review and meta-analysis reported a small increase in antipsychotic medication in LTC residents with dementia from 1991 to 2013,[37] whereas other studies have reported a decrease in the use of antipsychotic medication, albeit an increase in the use of antidepressants.[18,38,39] The prevalence of antipsychotic use in our sample is more than double compared to the latest figures in the U.S.[18]

In our study, the use of psychotropic medication in NHs decreased significantly, but this trend was not seen in ALFs. This could be partly because the residents in ALFs were more mobile, with less advanced dementia, and they may have suffered more often from neuropsychiatric symptoms than

249 the residents of NHs. Another possible explanation is that in Finland the staff in NHs includes more
250 registered nurses than in AFLs, thus having a better pharmacologic education and ability to assess
251 the possible benefits and adverse effects of psychotropic medication. The training of nurses has
252 been shown to improve physicians' prescribing practices in LTC.[40] Antipsychotics are often used to
253 treat neuropsychiatric symptoms of dementia even though the evidence of their effectiveness is
254 limited[41] and the guidelines suggest non-pharmacological treatments as the first line choise.[42] Even
255 though the use of Alzheimer medication increased significantly over the years, it did not decrease
256 the use of antipsychotics in ALFs.

257 It has also been suggested that older adults with dementia may express pain as neuropsychiatric
258 symptoms, such as agitation and aggression,[43,44] and that treating pain systematically reduces these
259 symptoms.[45] The steep rise in the use of opioids in both settings could reflect better pain recognition
260 and clinicians' efforts to optimize pain management to reduce neuropsychiatric symptoms among
261 residents with dementia. Alarming is that the concomitant use of antipsychotic medication remains
262 high and even keeps increasing at the same time in ALFs.

263 In our study, residents with dementia used less psychotropics and opioids and had a lower sedative
264 load than residents without dementia. People without dementia admitted to LTC probably suffer
265 from stroke, depression, other psychiatric illnesses, and disabling musculoskeletal diseases that
266 cause pain, increasing their use of various psychotropics.[46] People with chronic mental health
267 conditions such as schizophrenia are likely to require psychotropic medication, although the dosage
268 may need to be readjusted as they age.

269 To our knowledge, this is the first study with over 10-year follow-up investigating trends in the use
270 of both psychotropic medication and opioids among institutionalized older adults. Our study both
271 confirms earlier findings and provides novel data regarding the prevalence of psychotropic and
272 opioid use in LTC. The increasing use of Alzheimer medication or opioids has not significantly

decreased the use of psychotropics. Instead these medication changes have led to polypharmacy among vulnerable long term care population.

Conclusions/Relevance

Although the prevalence of psychotropics has decreased over the last 14 years in NHs, the rates of psychotropic use remain high in both NHs and ALFs. In addition, the rates of opioid use have almost tripled, leading to a high sedative load among vulnerable LTC residents. Clinicians should carefully consider the risk-to-benefit ratio when prescribing in LTC. Strategies for regular medication reviews and deprescribing in LTC are required.

Another finding with practical implications is that the LTC population profile has changed over time. Residents are more disabled and the severity of dementia has increased. This is key information for both clinicians and policy-makers to consider when planning LTC in the future. As the dementia disease progresses there are often changes in behavior implicating timely assessments and adjustments in person-centered care.

The authors declare that they have no conflicts of interest relevant to this report.

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Figure 1a. Mean number of psychotropics used by NH and ALF residents with and without dementia from 2003 to 2017.

Figure 1b. Mean number of antipsychotics used by NH and ALF residents with and without dementia from 2003 to 2017.

Figure 1c. Mean number of anxiolytics and hypnotics used by NH and ALF residents with and without dementia from 2003 to 2017.

Figure 1d. Mean number of antidepressants used by NH and ALF residents with and without dementia from 2003 to 2017.

Figure 2. The percentage of opioid users among NH and ALF residents with and without dementia from 2003 to 2017.

Figure 3. Mean number of sedatives used by NH and ALF residents with and without dementia from 2003 to 2017.