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Psychotropic drug prescription for nursing home residents with dementia: prevalence and associations with non-resident-related factors

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ABSTRACT

Objectives: To determine psychotropic drug prescription rates in nursing home residents with dementia and to identify associations with the so far understudied psychosocial non-resident-related factors.

Method: A cross-sectional, observational, exploratory design as part of PROPER I (PRescription Optimization of Psychotropic drugs in Elderly nuRsing home patients with dementia). Participants were 559 nursing home residents with dementia, 25 physicians, and 112 nurses in the Netherlands. Psychotropic drug prescription, non-resident-related and known resident-related variables were measured to operationalize the themes of our previous qualitative analysis.

Results: Fifty-six percent of residents were prescribed any psychotropic drug, 25% antipsychotics, 29% antidepressants, 15% anxiolytics, and 13% hypnotics, with large differences between the units. Multivariate multilevel regression analyses revealed that antipsychotic prescription was less likely with higher physicians' availability (odds ratio 0.96, 95% confidence interval 0.93–1.00) and that antidepressant prescription was more likely with higher satisfaction of nurses on resident contact (odds ratio 1.50, 95% confidence interval 1.00–2.25). Resident-related factors explained 6%–15% of the variance, resident- and non-resident-related factors together 8%–17%.

Conclusion: Prescription rates for antipsychotics are similar compared to other countries, and relatively low for antidepressants, anxiolytics, and hypnotics. Our findings indicate that improvement of prescribing could provisionally best be targeted at resident-related factors.

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Dementia; nursing home; psychotropics

Introduction

Although psychotropic drugs (PDs) have only modest efficacy for treatment of neuropsychiatric symptoms (NPS), and can cause severe side effects (Ballard & Waite, 2006; Knol et al., 2008; Langballe et al., 2014; McCleery, Cohen, & Sharpley, 2014; Nelson & Devanand, 2011; Schneider, Dagerman, & Insel, 2006; Seitz et al., 2013), these agents are widely prescribed in nursing home residents with dementia. Worldwide, 66%–79% of nursing home residents are treated with any PD, 12%–54% with antipsychotics (APs), 28%–40% with antidepressants (ADs), 16%–29% with anxiolytics, and 15%–23% with hypnotics (De Mauleon et al., 2014; Dutcher et al., 2014; Maust, Langa, Blow, & Kales, 2016; Stevenson et al., 2010; Vasudev et al., 2015; Zuidema, De Jonghe, Verhey, & Koopmans, 2011). In order to optimize prescription, it is relevant to be aware of the current prescription rates, and it is of major importance to know the correlates of the PD prescription, so that those susceptible to change can be improved.

Several factors contributing to PD prescription have been investigated, the most extensive of which were the resident-related factors. In general, more severe NPS (De Mauleon et al., 2014; Foebel et al., 2014; Gustafsson, Sandman, Karlsson, Gustafson, & Lovheim, 2013; Kleijer et al., 2014; Maust et al., 2016; Nijk, Zuidema, & Koopmans, 2009; Nishtala, McLachlan, Bell, & Chen, 2010), comorbid psychiatric disorders (Kamble, Chen, Sherer, & Aparasu, 2009; Larrayadieu et al., 2011; Nishtala et al., 2010), and less severe stage of dementia (Blass et al., 2008; Nijk et al., 2009) are associated with higher prescription rates. Non-resident-related factors are increasingly being recognized as potential correlates. Higher staff distress due to residents' agitation (Zuidema et al., 2011) and factors such as a larger facility (Kleijer et al., 2014), lower staff/resident ratio (Kim & Whall, 2006; Testad et al., 2010; Zuidema et al., 2011), and lower resident satisfaction of the number of staff, of personal care, and of recreational activities (Kleijer et al., 2014) are related to higher PD prescription. Also, qualitative studies have sought to elucidate additional factors (Cohen-Mansfield et al., 2005; Cornege-Blokland, Kleijer, Hertogh, & Van Marum, 2012; Smeets et al., 2014; Wood-Mitchell, James, Waterworth, Swann, & Ballard, 2008) and underpinned the need to explore the prescribing culture (Bonner et al., 2015). These studies point at an important share of psychosocial non-resident-related factors, including feeling powerless toward NPS, previous prescribing experiences of physicians, communication among professionals and with family, educational level of nurses, nursing home staffing, and continuity in care. So far,

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these psychosocial factors have to our best knowledge not been quantitatively studied. This study aims to obtain insight into current prescription rates and to identify the so far understudied psychosocial non-resident-related factors.

Methods

Design and setting

This exploratory study is part of PROPER I (Van der Spek et al., 2013). It has a cross-sectional, observational design and was conducted between January and July 2012 in Dutch nursing homes. In the Netherlands, nursing home locations are usually part of larger long-term care organizations with specific dementia special care units (DSCUs). DSCUs can be either small- (5–10 residents) or regular-scale (10–30 residents). Primary responsible nurses are assigned to individual residents, and physicians, mainly certified as elderly care physician, are employed by the nursing home (Koopmans, Lavrijsen, Hoek, Went, & Schols, 2010). We aimed for a sample size of 540 residents with dementia, with maximum contrast in prescription rates, and their nurses and physicians (Van der Spek et al., 2013). Therefore, we selected DSCUs based upon PD prescription rates as reported in questionnaires previously distributed among all Dutch elderly care physicians.

The local Medical Ethics Review Committee 'CMO Regio Arnhem-Nijmegen' rated the study [number 2012/226] and stated that it was in accordance with the applicable Dutch rules concerning review of research ethics committees and informed consent. The study was conducted in accordance with the Declaration of Helsinki (World Medical Association, 2013).

Measures

Table 1 shows all the measures included in this study.

Table 1. All measures included in this study.

Dependent variables
Psychotropic drug prescription
Independent variables
Resident-related factors
Age of resident
Sex of resident
Length of stay at DSCU
Dementia type
NPI-Q severity
CMAI
Non-resident-related factors
Mindset
NPI-Q emotional distress
SDCS
MAS-GZ subscale 'satisfaction of resident contact'
ADQ (physician)
ADQ (nurse)
Knowledge and experience
Profession (nurse)
Number of years employed at DSCU (nurse)
Number of years working as physician
Number of months working at DSCU (physician)
Communication and cooperation
MAS-GZ subscale 'satisfaction of colleague contact'
MAS-GZ subscale 'satisfaction of clarity'
External possibilities/limitations
Work Stress Scale
CVFS
Nurse/resident ratio during day
Nurse/resident ratio during night
Physicians' availability per resident
Number of residents per DSCU
Number of different caregivers at DSCU

DSCU: dementia special care unit, NPI-Q: Neuropsychiatric Inventory Questionnaire, CMAI: Cohen-Mansfield Agitation Inventory, SDCS: Strain in Dementia Care Scale, MAS-GZ: Maastricht Work Satisfaction scale for Healthcare, ADQ: Approaches to Dementia Questionnaire, CVFS: Competing Values Framework Scale.

Dependent variables

PD prescription was grouped according to the Anatomical Therapeutic Chemical classification into: APs (N05A), ADs (N06A), anxiolytics (N05B), and hypnotics (N05C) (Nordic Council on Medicines, 1990). PD prescription was measured as PD prescription at the day of assessment for treatment of NPS explained by the presence of dementia, a sleep disorder or a delirium, and excluding pro re nata use. The maximum time window between the use of PDs and possibly related factors was six weeks.

Independent variables

Selection of measures. For operationalization of non-resident-related factors, we used results of the previously conducted qualitative analysis of the PROPER I study (Smeets et al., 2014). We opted to analyze specifically those (sub)scales among the quantitative data, fitting in the four themes contributing to PD prescription, after critical review and consensus among the co-authors: (1) *Mindset*, e.g. perceptions and opinions of physicians and nurses toward the nature and intensity of NPS and toward PDs, (2) *Knowledge and experience* of physicians and nurses with regard to NPS and PDs, such as the level of training and the number of years of employment, (3) effective *Communication and collaboration* among healthcare professionals regarding NPS and PDs, and (4) *External possibilities/limitations*, comprising staffing issues, like sufficient time for the job, the number and continuity of nurses, and issues related to living within a nursing home setting. This led to the exclusion of variables regarding the use of psychosocial interventions, physical environment, and satisfaction of career perspective, of quality of care, and of unit supervisor. We also included known resident-related variables. Moreover, the qualitative results indicated that factors differ per class of PD, which compelled us to study the AP, AD, anxiolytics, and hypnotics separately.

Resident-related factors. We collected data on age, sex, length of stay at DSCU, and chart diagnosis of dementia as categorized into Alzheimer's dementia, vascular dementia, mixed Alzheimer's/vascular dementia, and other dementia (including 'not otherwise specified').

We assessed the severity of NPS using the 12-item Neuropsychiatric Inventory Questionnaire (NPI-Q) (De Jonghe, Kat, Kalisvaart, & Boelaarts, 2003; Kaufer et al., 2000). Symptoms were grouped into clinically meaningful clusters or individual symptoms, similar to this instrument's Nursing Home version (Zuidema et al., 2011). From these, we included only those that were potential indications for a specific class of PDs (Smalbrugge et al., 2008). For AP: psychosis (range 0–6, a higher score reflecting higher severity), agitation (range 0–9), and nighttime behavior (range 0–3); for AD: agitation, depression (range 0–3), anxiety (range 0–3); for anxiolytics: agitation and anxiety; and for hypnotics: anxiety and nighttime behavior. NPS were also assessed using the Cohen-Mansfield Agitation Inventory (CMAI) (De Jonghe & Kat, 1996; Zuidema, De Jonghe, Verhey, & Koopmans, 2007), consisting of 29 agitated behaviors, which we grouped into three clusters: physical aggression (range 8–56, a higher score reflecting more frequent occurrence), physically nonaggressive behavior (range

7–49), and verbally agitated behavior (range 4–28) (Zuidema et al., 2007). Also for the CMAI, we included only clusters that were potential indications: all three CMAI clusters for AP, physical aggression and verbally agitated behavior for AD and for anxiolytics, and none for hypnotics.

Non-resident-related factors. To operationalize nurses' perceptions and opinions, the *Mindset*, we used four measures. The first was the NPI-Q emotional distress scale which assesses distress caused by NPS, according to the aforementioned clusters. This resulted in the following ranges (higher score reflecting higher distress): 0–10 for psychosis, 0–15 for agitation, and 0–5 for depression, anxiety, and nighttime behavior. The second was the 27-item Strain in Dementia Care Scale (SDCS) (Orrung Wallin, Edberg, Beck, & Jakobsson, 2013) that measures nurses' feelings with regard to caring for residents with dementia (range 1–16, a higher score reflecting higher distress). The third measure was the subscale 'satisfaction of resident contact' from the Maastricht Work Satisfaction Scale for Healthcare (MAS-GZ) (Landeweerd, Boumans, & Nissen, 1996), consisting of three items on mutual liking between residents and nurses (range 1–5, a higher score indicating higher satisfaction). The fourth was the 19-item Approaches to Dementia Questionnaire (ADQ), which measures the attitude toward caring for people with dementia (Lintern, 2001) (range 19–95, with a higher score reflecting more positive attitude). To operationalize the *Mindset* of physicians, we also used the ADQ.

For operationalization of nurses' *Knowledge and experience*, we used their profession, categorized into nursing assistant, certified nursing assistant, or registered nurse, and the number of years employed at the current DSCU. For physicians, we used the number of years working as a physician, and the number of months working at the current DSCU.

We used two other MAS-GZ subscales to operationalize nurses' *Communication and cooperation*: 'satisfaction of colleague contact', with items on mutual liking between nurses and colleagues, and 'satisfaction of clarity', with items regarding tasks in the job.

To assess staffing issues of nurses within the *External possibilities/limitations* theme, we used the 8-item Work Stress Scale, an instrument on psychological stressors within healthcare (De Jonge, Landeweerd, & Nijhuis, 1995) (range 1–5, a higher score reflecting more stress). Moreover, we used the 6-item Competing Values Framework Scale (CVFS), which assesses dominance in four organizational cultures (Scott-Cawiezell, Jones, Moore, & Vojir, 2005; Van Beek & Gerritsen, 2010): clan (characterized by strong cohesion), adhocracy (which can adapt quickly to changes), hierarchy (with structure and rules), and market (result-oriented) (range 0–18, a lower score reflecting more dominancy). Furthermore, we used the nurse/resident ratio during the day (morning, afternoon, and evening) and during the night multiplied by 1000 to allow interpretation of the odds ratios, and the physician's availability in minutes per resident per week. Finally, we used the number of residents per DSCU as a measure for commotion within the nursing home setting, and, for assessing continuity in care, the total number of different caregivers (e.g. nurses, supporting personnel) at the DSCU.

Procedures

Variables were either collected per individual resident (PD prescription, resident characteristics, NPI-Q, and CMAI) or per group of residents (all other variables) (Van der Spek et al., 2013). Some data were retrieved by the researchers (PD prescription as documented in actual medication lists, resident characteristics (age, sex, length of stay at DSCU, and diagnosis of dementia according to the patient's physician using DSM-IV criteria) as documented in patient's charts, and institutional characteristics (nurse/resident ratio, number of residents per DSCU, and number of different caregivers) as reported by the DSCU's team leader). All other data were collected web-based as completed per nurse or physician. For description of the population of physicians and nurses, we also asked them for their age and sex.

Statistical analyses

We conducted both univariate and multivariate multilevel logistic regression analyses with the prescription of APs, ADs, anxiolytics, and hypnotics separately as dependent variables. For the univariate analyses, variables were individually used as fixed effects, with the levels nursing home location and DSCU as random intercepts. In the multivariate modeling, we entered all independent variables per cluster for each of the five aforementioned clusters into a unilevel logistic regression model and applied stepward backward likelihood ratio selection with entry $p < 0.05$, removal $p < 0.10$, classification cut-off 0.5, and maximum 20 iterations. This resulted in a preselected set of resident-related and four sets of non-resident-related factors (*Mindset*, and so on). Then, all variables from the five preselected sets were put together in a multilevel (resident within DSCU) logistic regression model.

In order to assess the robustness of our findings, we investigated whether and to which extent the five alternative pathways for selecting variables into the final models led to different results: (1) without analyzing the cluster of resident-related factors; this was done to explore their influence, (2) by adding the clusters in a sequential order: first resident-related factors, then *Mindset*, *Knowledge and experience*, and so on, since the factors in the clusters earlier in this chain are thought to have a more direct influence than those of the clusters later in this chain, (3) by using physicians instead of DSCU as level in model 2, to investigate if the selection depended on the level of clustering, (4) by applying model 2 as a 3-level model (residents within DSCUs within nursing home locations), to investigate whether locations explained part of the variation, and (5) by entering the clusters in revised sequential order as applied in 4.

We used the Nagelkerke R^2 of the logistic regression models to estimate the amount of variance in PD prescription explained by the resident- and non-resident-related variables, and we used Pearson correlations to check for multicollinearity between severity and emotional distress of NPS. For all analyses, we used SPSS 22.0 (IBM, Armonk, NY).

Results

Prevalence rates

Participants were 559 residents, 25 physicians, and 112 nurses, distributed over 12 long-term care organizations, 21 nursing home locations, and 44 DSCUs, located throughout the Netherlands. Thirty-three percent of the residents had a chart diagnosis of Alzheimer's dementia, 17% of vascular dementia, 11% of mixed Alzheimer's/vascular dementia, and

Table 2. Characteristics of study participants.

a. Characteristics of nursing home residents (*N* = 559)	
Mean age (years), [SD] (range)	84, [6.6] (62–100)
Sex, female *N* (%)	413 (74%)
Diagnosis of dementia, *N* (%)	
Alzheimer's dementia	186 (33%)
Vascular dementia	92 (17%)
Mixed Alzheimer's/vascular dementia	62 (11%)
Other dementia	219 (39%)
Length of stay at DSCU (months), [SD] (range)	23, [22.1] (0–118)
b. Characteristics of physicians (*N* = 25)	
Mean age (years), [SD] (range)	46, [11.2] (29–65)
Sex, female *N* (valid %)	16 (67%)
Current position, *N* (valid %)	
Elderly care physician	19 (79%)
Other physician	5 (21%)
Mean number of months working at DSCU, [SD] (range)	40, [29.3] (3–99)
Mean number of years working as physician, [SD] (range)	19, [12.3] (2–42)
c. Characteristics of nurses (*N* = 112)	
Mean age (years), [SD] (range)	43, [10.4] (22–61)
Sex, female *N* (valid %)	106 (98%)
Profession, *N* (valid %)	
Nursing assistant	10 (9%)
Certified nursing assistant	72 (67%)
Registered nurse	26 (24%)
Mean number of years working experience at current DSCU [SD] (range)	6.4, [6.3] (0–35)

SD: standard deviation, DSCU: dementia special care unit.

39% of other/not otherwise specified dementia. Characteristics of the participants are shown in Table 2. Prevalence of PD prescription was 56% for any PD, 25% for APs, 29% for ADs, 15% for anxiolytics, and 13% for hypnotics. Ranges varied: for any PD from 43% to 75% per nursing home location and from 33% to 88% per DSCU (see Table 3).

Correlates

This paragraph describes the factors with statistically significant associations in both univariate and multivariate analyses according to the main model. The latter are also presented in Table 4. Full results are shown in the Appendices.

Resident-related factors

AP prescription was significantly more likely in the univariate analyses for residents with lower age, male sex, and more severe NPS (NPI-Q psychosis, agitation, depression, anxiety, nighttime behavior, and CMAI physical aggression, physically nonaggressive behavior, and verbally agitated behavior). In the multivariate model, AP prescription was more likely for longer stays at the DSCU and more severe NPS (CMAI physical aggression and physically nonaggressive behavior). Odds of AD prescription were higher in univariate analyses with more severe NPS (NPI-Q psychosis, agitation, depression and anxiety, and CMAI physical aggression and verbally agitated behavior). Anxiolytics prescription was more likely in the univariate analyses for residents with more severe NPS (NPI-Q anxiety and nighttime behavior, and CMAI physically nonaggressive behavior), and in the multivariate analyses with more severe NPS (NPI-Q anxiety). Hypnotics prescription was more likely in the univariate analyses for residents with more severe NPS (NPI-Q nighttime behavior and CMAI physically nonaggressive behavior).

Table 3. Prevalence of psychotropic drug prescription (*N* = 559).

	Prevalence *N* (%)	Standard deviation (range)	
		Per nursing home location	Per DSCU
Psychotropics	311 (56%)	9.0 (43%–75%)	13.1 (33%–88%)
Antipsychotics	141 (25%)	14.5 (10%–57%)	18.2 (0%–62%)
Antidepressants	163 (29%)	11.5 (12%–56%)	15.4 (0%–75%)
Anxiolytics	85 (15%)	7.9 (0%–31%)	12.8 (0%–60%)
Hypnotics	74 (13%)	8.3 (0%–27%)	11.9 (0%–45%)

DSCU: dementia special care unit.

Table 4. Resident- and non-resident-related factors of psychotropic drug prescription in multivariate multilevel logistic regression analyses in 559 nursing home residents with dementia.

	AP OR (95% CI)	AD OR (95% CI)	Anxiolytics OR (95% CI)	Hypnotics OR (95% CI)
Resident-related factors				
Length of stay at DSCU	1.01 (1.00–1.02)	–	–	–
NPI-Q S anxiety	–	–	1.64 (1.16–2.30)	–
CMAI physical aggression	1.05 (1.00–1.09)	–	–	–
CMAI physically nonaggressive behavior	1.06 (1.03–1.09)	–	–	–
Non-resident-related factors				
Mindset				
MAS-GZ resident contact	–	1.50 (1.00–2.25)	–	–
Knowledge and experience	–	–	–	–
Communication and cooperation	–	–	–	–
External possibilities/limitations				
Physicians' availability per resident	0.96 (0.93–1.00)	–	–	–

AP: antipsychotics, AD: antidepressants, OR: odds ratio, CI: confidence interval, DSCU: dementia special care unit, NPI-Q S: Neuropsychiatric Inventory Questionnaire Severity, CMAI: Cohen-Mansfield Agitation Inventory, MAS-GZ: Maastricht Work Satisfaction Scale for Healthcare. Ranges: 0–3 for NPI-Q S anxiety, 8–56 for CMAI physical aggression, 7–49 for CMAI physically nonaggressive behavior, 1–5 for MAS-GZ. Only factors with statistically significant ORs are shown, full results are presented in the appendices. ORs are rounded on two decimal places, statistical significance is based upon the crude numbers.

Non-resident-related factors

From the *Mindset* cluster, the odds of AP prescription were higher in the univariate analyses with higher emotional distress in nurses due to NPS (NPI-Q psychosis, agitation, depression, anxiety, and nighttime behavior). AD prescription was more likely in the univariate analyses with higher emotional distress due to NPS (NPI-Q agitation, depression, and anxiety), and in the multivariate analyses with higher nurses' satisfaction of patient contact (MAS-GZ). Odds of anxiolytics prescription were higher with higher emotional distress due to NPS (NPI-Q psychosis, agitation, anxiety, and nighttime behavior) in the univariate analyses. Hypnotics prescription was more likely with higher emotional distress due to NPS (NPI-Q nighttime behavior) in the univariate analyses.

From the clusters *Knowledge and experience* and *Communication and cooperation*, none of the factors showed statistically significant relations, whereas from the *External possibilities/limitations cluster*, the multivariate analyses showed that AP prescription was less likely with a higher availability of the physicians.

Other results

Analysis results of the five alternative multivariate models were fairly consistent, with two exceptions for models 2 and 3: hypnotics prescription was less likely with a higher satisfaction of clarity regarding tasks in the job and with higher work stress.

The Nagelkerke R^2 showed that resident-related factors explained 6%–15% of the variance; resident-related and non-resident-related factors together explained 8%–17%. The total explained variance varied per class of PD: it was higher for AP and hypnotics (respectively 17% and 13%) than for AD and anxiolytics (both 8%).

The Pearson correlations between NPI-Q severity clusters/symptoms and their corresponding emotional distress NPI-Q clusters/symptoms were: 0.81 for psychosis, 0.84 for agitation, 0.78 for depression, 0.83 for anxiety, and 0.77 for nighttime behavior.

Discussion

This study provides the latest Dutch PD prescription rates and is also the first exploratory study that quantitatively addresses the association of psychosocial non-resident-related factors with PD prescription. We found a relative absence of statistically significant associations, regardless of the statistical modeling strategy and class of PDs, and a very limited contribution to the explained variance, whereas the prevalence rates per nursing home location and DSCU varied considerably. These findings indicate that further improvement of PD prescription is very well possible.

Comparing the prevalence rates in our population with the worldwide ranges shown in the introduction, it appears that the prescription rate of APs in our sample is rather average, whereas our rates are relatively low for ADs, anxiolytics, and hypnotics (De Mauleon et al., 2014; Dutcher et al., 2014; Zuidema et al., 2011). When we add our figures to a recent analysis of trends in Dutch PD use, we can conclude that the prevalence of PDs in general, ADs, anxiolytics, and hypnotics is rather similar and constant over time, whereas AP prescription declines (Zuidema, Koopmans, Schols, Achterberg, & Hertogh, 2015). Regarding the correlates, only a few can be compared with previous literature, since most factors have not been studied before. We found that higher emotional distress in nurses due to NPS is related with higher odds of all classes of PD prescription, which is in line with a previous study (Zuidema et al., 2011). Furthermore, just as Azermai, Elseviers, Petrovic, Van Bortel, and Vander Stichele (2011), we did not find any relations for nurse/residents ratio whereas others did (Kim & Whall, 2006; Zuidema et al., 2011). The absence of a relation with the nurses' profession is fairly in line with the absence found regarding nurses' educational level in the aforementioned study (Azermai et al., 2011). And although several publications suggest that organizational culture might influence prescription behavior (Hughes, Lapane, Watson, & Davies, 2007; Tjia, Gurwitz, & Briesacher, 2012; Van Der Putten, Wetzels, Bor, Zuidema, & Koopmans, 2014), our results did not confirm this.

Strengths of this study are that we could extend and deeply explore quantitatively the findings of the qualitative part of the PROPER I study, with a substantial number of residents and nursing home locations throughout the Netherlands. The main limitation is that we had too many variables for confirmatory analyses. On theoretical grounds, there was no reason to exclude any of those, which we tried to overcome by clustering the variables. The concordance between the results of the uni- and multivariate analyses, in which variables were studied independently by correcting for all other variables, adds to the confidence that the clustering did not affect the findings. Also, the choice for the levels in the multivariate analyses (e.g. physician instead of DSCU) did not affect the outcome, concluding from the fairly consistent results over the multiple statistical approaches. Finally, since we chose for a cross-sectional instead of a longitudinal design for feasibility reasons, we could not draw conclusions on causal relations.

For interpretation of associations with non-resident-related factors, four subjects require comment. First, it is striking that the two statistically significant associations in the multivariate analyses with non-resident-related factors both concern the contact between the nursing home professional and the resident. Although we have to be cautious not to overrate their relevance considering the number of associations that we studied, the contribution of interpersonal contact in PD prescription may be an important starting point for further research. Second, the strong correlation between the NPI-Q's emotional distress and severity might on one hand indicate that the nurses' view of severity was colored by personally perceived distress, or by emotional distress just upon scoring severity. This weakness of the NPI-Q, as of its mother version the NPI, is known (Kaufer et al., 1998; Kaufer et al., 2000), and may have diluted a potential stronger contribution of either the resident-related NPI severity or the non-resident-related *Mindset* factor NPI distress. On the other hand, the correlation between NPI severity and distress may as well implicate that NPS were so far erroneously identified as the determinant, meaning that nurses' distress due to NPS might just as well be the main contributor to PD prescription. Third, it may be interesting to differentiate between the theoretical possibilities to operationalize the qualitative themes. Operationalization of the factors within the clusters *Mindset* and *Communication and cooperation* and part of those within *External possibilities/limitations* into measurable variables is rather complex. A questionnaire may not be able to comprise these psychosocial concepts, social interactions within and between groups of people cannot be reduced to one-on-one relations, and evaluating a number of variables may be insufficient to unravel the reality. In contrast, this complexity is less applicable for the quantifiable measures among the *External possibilities/limitations* (physician's availability per resident, number of residents per DSCU, nurse/resident ratios, and the number of different caregivers). The absence of significant associations of these quantifiable variables is a stronger indication that those are not likely to contribute to PD prescription. Fourth, the wide ranges in prescription rates between different locations and DSCUs, and the large unexplained variance illustrate that the complexity of PD prescribing is yet not unraveled.

Tentatively interpreting these exploratory findings for clinical practice, it is important to be aware of the possibly limited extent to which PD prescription can be affected by non-resident-related factors. Future studies may therefore focus on associations with so far unstudied resident-related factors. Nevertheless, the fact that NPS were found to be the strongest correlates suggests that clinical practice should at least target NPS, after all being the indication for PD prescription.

Conclusion

AP prescription in this study is lower than in previous Dutch studies, but the large differences between locations and units leave room for further improvement. Prescription rates of ADs, anxiolytics, and hypnotics are comparable with the rates of previous Dutch studies but are internationally rather low. Although this study has some limitations, we investigated many non-resident-related factors meticulously. The relative absence of significant associations suggests that improvement of PD prescribing could provisionally best be targeted at resident-related factors.

The low prescription rates in the international perspective and the prescription rates of AP declining over time suggest that especially AP prescription is improving, although the large differences in prevalence rates between locations and units leave room for enhancement.

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Appendices

Appendix 1. Resident-related factors of psychotropic drug prescription in univariate and multivariate multilevel logistic regression analyses in 559 nursing home residents with dementia.

	AP prescription OR (95% CI)		AD prescription OR (95% CI)		Anxiolytics prescription OR (95% CI)		Hypnotics prescription OR (95% CI)	
	Univariate	Multivariate	Univariate	Multivariate	Univariate	Multivariate	Univariate	Multivariate
Age of resident	**0.96 (0.94–0.99)**	0.97 (0.94–1.00)	0.97 (0.95–1.00)	–	0.98 (0.94–1.01)	–	0.97 (0.94–1.01)	–
Sex of resident								
Male	**1.59 (1.03–2.46)**	–	0.96 (0.63–1.46)	–	0.98 (0.58–1.67)	–	1.33 (0.77–2.28)	–
Female (ref)								
Length of stay at DSCU	1.01 (1.00–1.01)	**1.01 (1.00–1.02)**	1.00 (0.99–1.01)	–	1.00 (0.99–1.01)	–	0.99 (0.98–1.00)	–
Dementia type								
Alzheimer's dementia	1.31 (0.81–2.12)	–	1.20 (0.77–1.85)	–	0.89 (0.51–1.57)	–	1.10 (0.61–1.95)	–
Vascular dementia	1.30 (0.73–2.34)	–	1.14 (0.66–1.96)	–	1.09 (0.56–2.13)	–	1.08 (0.53–2.21)	–
Mixed Alzheimer's /vascular dementia	1.53 (0.79–2.96)	–	0.88 (0.46–1.68)	–	1.37 (0.66–2.86)	–	0.56 (0.21–1.54)	–
Other dementia (ref)								
NPI-Q S psychosis	**1.21 (1.08–1.35)**	–	**1.19 (1.07–1.33)**	–	1.12 (0.99–1.27)	–	1.05 (0.91–1.21)	–
NPI-Q S agitation	**1.18 (1.09–1.26)**	–	**1.10 (1.02–1.17)**	1.07 (1.00–1.15)	1.07 (0.98–1.16)	–	1.05 (0.96–1.15)	–
NPI-Q S depression	**1.27 (1.05–1.54)**	–	**1.43 (1.20–1.71)**	1.19 (0.90–1.58)	1.14 (0.91–1.42)	–	1.12 (0.88–1.42)	–
NPI-Q S anxiety	**1.22 (1.01–1.48)**	–	**1.24 (1.04–1.48)**	–	**1.61 (1.32–1.97)**	**1.64 (1.16–2.30)**	1.23 (0.98–1.54)	–
NPI-Q S nighttime behavior	**1.25 (1.00–1.56)**	–	1.13 (0.91–1.40)	–	**1.39 (1.09–1.79)**	–	**1.62 (1.25–2.09)**	1.51 (1.00–2.28)
CMAI physical aggression	**1.07 (1.04–1.11)**	**1.05 (1.00–1.09)**	**1.03 (1.00–1.06)**	–	1.03 (1.00–1.07)	–	0.99 (0.94–1.03)	–
CMAI physically nonaggressive behavior	**1.07 (1.04–1.10)**	**1.06 (1.03–1.09)**	1.02 (1.00–1.05)	–	**1.05 (1.02–1.08)**	–	**1.06 (1.03–1.10)**	–
CMAI verbally agitated behavior	**1.04 (1.01–1.08)**	–	**1.04 (1.01–1.08)**	–	1.03 (1.00–1.08)	–	1.00 (0.95–1.04)	–

OR: odds ratio, CI: confidence interval, DSCU: dementia special care unit, NPI-Q S: Neuropsychiatric Inventory Questionnaire Severity clusters/symptoms, CMAI: Cohen-Mansfield Agitation Inventory – long form. Ranges: 0–6 for NPI-Q S psychosis, 0–9 for NPI-Q S agitation, 0–3 for NPI-Q S depression, 0–3 for NPI-Q S anxiety, 0–3 for NPI-Q S nighttime behavior, 8–56 for CMAI physical aggression, 7–49 for CMAI physically nonaggressive behavior, and 4–28 for CMAI verbally agitated behavior. Blank cells represent variables not entered in the multivariate models, and bold/grey shading indicates statistical significance. The criterion to select variables was $p < 0.10$. For a description of precision of the selected variables, 95% CI are presented. ORs are rounded on two decimal places, statistical significance is based upon the crude numbers.

Appendix 2. Non-resident-related factors of psychotropic drug prescription in univariate and multivariate multilevel logistic regression analyses in 559 nursing home residents with dementia.

	AP prescription		AD prescription		Anxiolytics prescription		Hypnotics prescription	
	Univariate OR (95% CI)	Multivariate OR (95% CI)	Univariate OR (95% CI)	Multivariate OR (95% CI)	Univariate OR (95% CI)	Multivariate OR (95% CI)	Univariate OR (95% CI)	Multivariate OR (95% CI)
Mindset								
NPI-Q E psychosis	**1.16 (1.04–1.29)**	–	1.09 (0.99–1.21)	–	**1.16 (1.04–1.31)**	–	1.00 (0.87–1.16)	–
NPI-Q E agitation	**1.15 (1.08–1.23)**	1.05 (0.96–1.14)	**1.08 (1.02–1.15)**	–	**1.08 (1.01–1.16)**	–	1.01 (0.92–1.09)	–
NPI-Q E depression	**1.31 (1.09–1.56)**	–	**1.42 (1.20–1.67)**	1.19 (0.92–1.55)	1.18 (0.96–1.44)	–	1.01 (0.80–1.28)	–
NPI-Q E anxiety	**1.25 (1.05–1.49)**	–	**1.22 (1.04–1.44)**	–	**1.43 (1.19–1.72)**	0.98 (0.72–1.35)	1.11 (0.89–1.38)	–
NPI-Q E nighttime behavior	**1.34 (1.10–1.64)**	–	1.18 (0.97–1.44)	–	**1.42 (1.15–1.76)**	–	**1.44 (1.14–1.80)**	1.07 (0.74–1.54)
SDCS	0.99 (0.82–1.19)	–	1.06 (0.90–1.24)	–	1.01 (0.83–1.22)	–	1.03 (0.83–1.28)	–
MAS-GZ resident contact	1.24 (0.77–1.99)		1.44 (0.97–2.15)	**1.50 (1.00–2.25)**	0.87 (0.54–1.41)	–	1.00 (0.57–1.77)	–
ADQ (physician)	0.98 (0.91–1.06)	1.01 (0.94–1.08)	0.99 (0.93–1.04)	–	0.99 (0.94–1.05)	–	0.94 (0.88–1.00)	0.98 (0.91–1.06)
ADQ (nurse)	1.00 (0.96–1.04)	0.98 (0.94–1.03)	1.02 (0.98–1.05)	–	1.01 (0.97–1.05)	–	1.02 (0.97–1.07)	–
Knowledge and experience								
Profession (nurse)								
Nursing assistant	0.59 (0.23–1.55)	–	0.89 (0.39–2.00)	–	1.02 (0.38–2.72)	–	0.54 (0.17–1.73)	–
Certified nursing assistant	1.02 (0.61–1.69)	–	1.04 (0.67–1.61)	–	1.16 (0.68–1.97)	–	0.70 (0.40–1.22)	–
Registered nurse (ref)								
Number of years employed at DSCU (nurse)	1.00 (0.96–1.03)	–	1.00 (0.97–1.03)	–	0.99 (0.95–1.04)	–	1.00 (0.96–1.05)	–
Number of years working as physician	1.00 (0.98–1.03)	1.01 (1.00–1.02)	1.00 (0.98–1.02)	–	1.00 (0.98–1.02)	–	1.02 (0.99–1.04)	–
Number of months working at DSCU (physician)	1.01 (1.00–1.02)	–	1.00 (1.00–1.01)	–	1.00 (0.99–1.01)	–	1.00 (0.99–1.01)	–
Communication and cooperation								
MAS-GZ colleague contact	1.12 (0.69–1.81)	–	1.09 (0.72–1.65)	–	0.87 (0.53–1.42)	–	0.94 (0.54–1.66)	–
MAS-GZ clarity	1.30 (0.75–2.28)	1.40 (0.78–2.52)	0.83 (0.53–1.31)	–	0.98 (0.58–1.65)	–	0.77 (0.43–1.41)	–
External possibilities/limitations								
Work stress scale	1.02 (0.67–1.56)	–	1.04 (0.73–1.48)	–	1.14 (0.75–1.73)	–	0.77 (0.46–1.27)	–
CVFS clan culture	0.98 (0.91–1.05)	–	1.01 (0.95–1.06)	–	1.01 (0.95–1.08)	0.90 (0.80–1.00)	1.07 (0.98–1.17)	0.93 (0.83–1.05)

(*continued*)

	AP prescription		AD prescription		Anxiolytics prescription		Hypnotics prescription	
	Univariate OR (95% CI)	Multivariate OR (95% CI)	Univariate OR (95% CI)	Multivariate OR (95% CI)	Univariate OR (95% CI)	Multivariate OR (95% CI)	Univariate OR (95% CI)	Multivariate OR (95% CI)
CVFS adhocracy culture	1.01 (0.92–1.11)	–	1.05 (0.97–1.14)	–	0.95 (0.87–1.04)	0.90 (0.80–1.01)	0.96 (0.87–1.07)	0.91 (0.77–1.08)
CVFS hierarchy culture	0.99 (0.91–1.08)	–	0.96 (0.89–1.04)	–	1.03 (0.94–1.12)	–	1.00 (0.90–1.10)	0.89 (0.74–1.08)
CVFS market culture	1.03 (0.96–1.11)	–	0.98 (0.93–1.04)	–	1.00 (0.93–1.08)	–	1.10 (0.99–1.22)	–
Nurse/resident ratio during day × 1000	1.00 (0.99–1.01)	–	1.00 (0.99–1.00)	–	1.00 (0.99–1.01)	–	1.00 (0.99–1.01)	–
Nurse/resident ratio during night × 1000	1.00 (0.99–1.02)	–	1.01 (1.00–1.02)	–	1.00 (0.98–1.01)	–	0.98 (0.97–1.00)	0.98 (0.97–1.00)
Physicians' availability per resident	0.97 (0.94–1.00)	**0.96 (0.93–1.00)**	0.98 (0.96–1.00)	0.98 (0.96–1.00)	1.01 (0.99–1.04)	–	1.00 (0.97–1.03)	–
Number of residents per DSCU	1.01(0.98–1.05)	–	1.00 (0.98–1.02)	–	0.99 (0.97–1.02)	–	0.99 (0.96–1.02)	–
Number of different caregivers	1.00 (0.97–1.03)	–	0.99 (0.97–1.01)	–	1.00 (0.97–1.02)	–	0.98 (0.95–1.01)	–

OR: odds ratio, CI: confidence interval, NPI-Q E: Neuropsychiatric Inventory Questionnaire Emotional distress clusters/symptoms (range 0–10 for psychosis, 0–15 for agitation, 0–5 for depression, for anxiety, and for nighttime behavior), SDCS: Strain in Dementia Care Scale (range 1–16), MAS-GZ: Maastricht Work Satisfaction Scale for Healthcare (range 1–5 for each subscale), ADQ: Approaches to Dementia Questionnaire (range 19–95), DSCU: dementia special care unit, CVFS: Competing Values Framework Scale (range 0–18). The work stress scale ranges from 1 to 5. Blank cells represent variables not entered in the multivariate models, and bold/grey shading indicates statistical significance. The criterion to select variables was $p < 0.10$. For a description of precision of the selected variables, 95% CI are presented. ORs are rounded on two decimal places, statistical significance is based upon the crude numbers.