Review

The Prevalence and Course of Neuropsychiatric Symptoms in Nursing Home Patients With Dementia: A Systematic Review

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Abstract

Background: Persons with dementia frequently exhibit neuropsychiatric symptoms (NPSs). Previous studies have indicated that the prevalence is particularly high in nursing home (NH) patients. However, differences in methodology in studies of the prevalence and course of NPSs have made it difficult to compare their results.

Methods: We searched the electronic databases MEDLINE, EMBASE, PsycINFO, Ovid Nursing, and AgeLine from their inception until July 2012 using medical subject headings to identify studies that reported figures on the prevalence and course of NPSs in NH patients with dementia.

Results: A total of 28 studies met the inclusion criteria. In total, 8468 and 1458 persons participated in the prevalence and longitudinal studies, respectively. The weighted mean prevalence of having at least one NPS was 82%. Although the prevalence of individual symptoms varied, the highest prevalence figures were found for agitation and apathy. The persistence of individual NPSs varied substantially, but in these studies, having at least one NPS was highly persistent across the studies.

Conclusion: This review confirms that clinically significant NPSs are common in NH patients with dementia. Even though great variability exists across studies, recent studies applying similar methodology have made comparisons between studies feasible, revealing relatively consistent prevalence patterns for individual symptoms. The natural course of symptoms deserves closer attention. This is vital in planning prevention and treatment of NPSs in NH patients with dementia.

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Virtually everyone with dementia will experience some type of neuropsychiatric symptoms (NPSs), also termed behavioral and psychological symptoms of dementia, over the course of the disease.1 NPSs include psychiatric symptoms (such as delusions, hallucinations, depressive symptoms, anxiety, or euphoria) and behavioral symptoms (such as agitation, aggression, apathy, and disinhibition). Even though cognitive symptoms and functional impairment receive most of the attention in research on dementia, several studies have shown that NPSs are an individual risk factor for increased caregiver burden, earlier institutionalization, and higher costs of care.2,3

A large proportion (50–80%) of nursing home (NH) patients have a dementia disorder.4-6 Previous reports have indicated that the prevalence and severity of NPSs are particularly high in NHs,5,7 and that the NPSs are often treated with psychotropic drugs.8,9 The high prevalence of psychotropic drug use among NH patients with dementia contrasts with the uncertain efficacy and considerable risk for adverse effects of such drugs when used by patients with dementia.10 Most treatment recommendations advise that nonpharmacologic treatment should be the first-line treatment.11 However, the evidence for this treatment is also uncertain.12

Consequently, NPSs remain a substantial challenge for those providing health and care services in NH. Updated knowledge about the prevalence and course of NPSs in NH is important to plan the physical environment, staff education, and future treatment approaches. Comparing results from earlier studies has been difficult because of varying sample selection, incomplete reports of demographic data, and the use of different assessment methods. Over the past few years, a number of studies have applied similar methodology making comparison of results feasible. The aim of this review is to provide updated information about the prevalence and course of NPSs in NH patients with dementia. We have focused on descriptive studies but have also included data from clinical trials when these data were judged to be representative of NH patients with dementia.
Methods

Search Strategy

The review was conducted according to the PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines.13 We searched the electronic databases MEDLINE, PsycINFO, EMBASE, Ovid Nursing, and Ageline from inception to June 2012, as well as the Cochrane Library. We used the following medical subject headings to identify articles on the prevalence of NPSs in patients with dementia living in NHs:

- “Dementia” OR “Dementia, Vascular” OR “Dementia, Multi-Infarct” OR “Alzheimer Disease” OR “Lewy Body Disease” OR “Pick Disease of the Brain” OR “Frontotemporal Lobar Degeneration” OR “Cognition Disorders” AND
- “Affect” OR “Aggression” OR “Anxiety” OR “Appetite” OR “Behavioral Symptoms” OR “Delusions” OR “Depressive Disorder” OR “Eating Disorders” OR “Euphoria” OR “Hallucinations” OR “Irritable Mood” OR “Mental Disorders” OR “Mood Disorders” OR “Neurobehavioral Manifestations” OR “Neuropsychological Tests” OR “Neuropsychology” OR “Pain” OR “Psychomotor Agitation” OR “Psychotic Disorders” OR “Psychiatric Status Rating Scales” OR “Sexual Behavior” OR “Social Behavior Disorders” OR “Sleep Disorders” AND
- “Cohort Studies” OR “Epidemiologic Studies” OR “Follow-Up Studies” OR “Longitudinal Studies” OR “Prospective Studies” OR “Prevalence” OR “Incidence” AND
- “Long-Term Care” OR “Nursing Homes” OR “Progressive Patient Care” OR “Skilled Nursing Facilities” OR “Assisted living” OR “Homes for the Aged”

The reference lists of retrieved articles and previous reviews on the prevalence and course of NPSs were hand-searched for articles not identified by the initial search.

Study Selection/Inclusion Criteria

Titles and abstracts identified by the search were screened independently by two authors (G.S. and S.B.). The articles were included in the review if they fulfilled the following criteria: (1) English language or other language with English abstract provided that prevalence figures might be extracted from the abstracts or tables or figures in the text; (2) data reported on NH patients with dementia according to established diagnostic criteria [Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) (DSM-IV),14 International Classification of Diseases, Tenth Revision (ICD-10),15 National Institute of Neurological and Communicative Disorders and Alzheimers Disease and Related Disorders (NINCDS-ADRDA)16] or established cutoff values on well-known assessment scales (Clinical Dementia Rating Scale,17 Global Deterioration Scale,18 Functional Assessment Staging,19 Mini-Mental State Examination20); (3) the prevalence of NPSs was reported as the proportion of patients with the symptom applying standardized assessment instruments; (4) the study included at least 50 participants.

The full-text articles that were retrieved were reviewed by two of the authors (G.S. and S.B.). When there were discrepancies in the selection of studies, this was discussed in a meeting and the third author (K.E.) was consulted if the discrepancy persisted.

Data Extraction

Data on the first author, year of publication, year of data collection, country of origin, number of patients included, diagnostic instruments or assessment scales for dementia diagnosis, level of dementia, use of psychotropic drugs, and prevalence rates of NPSs were extracted from the studies. (The data were extracted by G.S. and subsequently reviewed for consistency by S.B.) We included data on prevalence provided that the cutoff point for defining the presence of a symptom was described. Some studies reported the prevalence of any level of a symptom, whereas other studies reported the prevalence of symptoms of a certain severity (eg, clinically significant symptoms). For some of the studies, supplementary data were retrieved after contacting the author of the article (specified in Tables 1 and 2).

Data Synthesis

Information on study characteristics and findings is presented in Tables 1 and 2; the results are summarized in the text. For measures comparable across studies, a weighted mean (wmean; of means or proportions) and range of results is presented, to account for the large variation in sample size. Otherwise, the results in the text are summarized as median and range.

Results

Study Selection

The process of selecting articles for the review is illustrated in Figure 1. A total of 1559 studies were identified through searches of electronic databases, and 25 additional studies were identified by hand; in total, there were 1584 unique studies. Based on screening of titles and abstracts, 151 full-text articles were reviewed according to the inclusion criteria. The inclusion criteria were met in 28 articles. There were 25 articles on the prevalence6,7,21–43 and 7 articles on the course12,23,31,41,44–46 of NPS. Figures from four of the articles are included both among the prevalence and the course articles.22,23,31,41

Characteristics of Included Studies

Prevalence studies

In total, 8486 patients participated in the included studies. The median number of study participants was 212 (range 59–1322). The wmean age was 82.7 years (range 59–86). The wmean proportion of women was 73.6% (range 21–92). Dementia was diagnosed according to diagnostic criteria in 12 studies, to threshold values on established rating scales (Mini-Mental State Examination, Clinical Dementia Rating Scale, Functional Assessment Staging) in 5 studies, a combination of diagnostic criteria and threshold values in 2 studies, and according to a chart diagnosis in 6 studies. A majority of the patients had moderate or severe dementia. Psychotropic drug use was reported in 14 studies. The wmeans (range) of users of any psychotropic drug, antipsychotics, and antidepressants were 68.3% (48–88), 31.8% (16–53), and 31.4% (10–47), respectively. The Neuropsychiatric Inventory (NPI)47 was used in eight studies, the Cohen-Mansfield Agitation Inventory48 in six studies, the Cornell Scale for Depression in Dementia49 in four studies, the Psychogeriatric Dependency Rating Scale50 in three studies, and the Behavioral Pathology in Alzheimer’s Disease rating scale51 in two studies. The other assessment scales, Dementia Mood Assessment Scale,52 Apathy Evaluation Scale,53 a modified version of Clinical Interview Schedule,54 Montgomery-Aasberg Depression Rating Scale,55 Ryden Aggression Scale,56 Memory and Behavior Problems Check List—nursing home version,42 and Modified Present State Examination57 were used in only one study each.
Longitudinal studies

Seven longitudinal studies fulfilled the inclusion criteria. In total, 1458 patients completed follow-up. The median number of participants was 117 (range 86–633). Follow-up varied between 4 months and 2 years with 2 to 5 assessments. The wmean age was 82.9 years (range 80–84). The wmean proportion of women was 73.7% (range 64–76). The NPI was used in 3 studies, and the Cornell Scale for Depression in Dementia, the Brief Agitation Rating Scale,58 the Clinical Interview Schedule, and the Memory and Behaviour Problems Check List—nursing home version were each used in one study.

Prevalence of NPSs

To increase comparability, we report the prevalence data from the NPI studies separately. All of the prevalence figures are presented as wmean and range. The wmean prevalence (range) of any NPS symptom was 82% (38–95) of the patients. At least one NPI symptom was present in the wmean of 79% (70–86) of the patients.

Agitation

The wmean of the prevalence (range) of aggression was 32% (11–77), whereas other agitation symptoms were found in 36% (17–67). Any one agitation symptom as measured by the Cohen-Mansfield Agitation Inventory was present in wmean of 79% (66–83).

The wmeans of the prevalence (range) of agitation/aggression, disinhibition, irritability, and aberrant motor behavior as measured by the NPI were 30% (24–48), 18% (9–21), 31% (20–35), and 25% (15–39), respectively.

Psychosis

Delusions and hallucinations were present in the wmeans (range) of 22% (1–54) and 14% (1–39) of the study participants, respectively. Delusions were equally or more prevalent than hallucinations in all of the studies. The wmeans of the prevalence of delusions and hallucinations as measured by the NPI were 19% (11–26) and 9% (5–14), respectively.

Affective symptoms

Depressive symptoms were present in a wmean (range) of 28% (9–66) of the study participants. The wmeans of the prevalence of depressive symptoms and anxiety as measured by the NPI were 20% (10–26) and 21% (12–26), respectively.

Apathy

The wmean (range) of the prevalence of apathy was 36% (17–82). The wmean of the prevalence of apathy as measured by the NPI was 32% (23–48).

Course of NPSs

The change in prevalence and severity of NPSs is presented in Table 2. The prevalence or severity of NPSs was unchanged, except for one study that reported a decreasing prevalence of depression41 and one study that reported a decreasing severity of depression and reduction in the NPI total score.23 The persistence, incidence, and cumulative prevalence rates of any one NPS varied between 51% and 89%, 20% and 56%, and 48% and 97%, respectively.

Agitation

The persistence rate of agitation/aggression, disinhibition, and aberrant motor behavior ranged over 53% to 75%, 10% to 79%, and 42% to 68%, respectively. The incidence rates of agitation/aggression, disinhibition, and aberrant motor behavior ranged over 10% to 19%, 5% to 19%, and 3% to 16%, respectively. The cumulative prevalence rate of agitation/aggression, disinhibition, and aberrant motor behavior ranged over 27% to 54%, 27% to 50%, and 46% to 50%, respectively.

Psychosis

The persistence rate of delusions and hallucinations ranged over 13% to 66% and 25% to 100%, respectively. Correspondingly, the incidence rate ranged over 3% to 17% and 0% to 8%, respectively, and the cumulative prevalence rate ranged over 21% to 45% and 10% to 18%, respectively.

Depression and apathy

The persistence, incidence, and cumulative prevalence rates of depression ranged over 0% to 85%, 3% to 14%, and 27% to 46%, respectively. The persistence, incidence, and cumulative prevalence rates of apathy ranged over 36% to 70%, 9% to 27%, and 45% to 53%, respectively.

Discussion

This review has identified a substantial number of studies on the prevalence of NPSs, but fewer studies on the course of NPSs. The interpretation of earlier studies has been difficult because of varying assessment methods and definitions of thresholds for identifying cases, as well as various sample characteristics, as pointed out in previous reviews.59–61 However, the last decade has seen several studies applying similar or identical assessment instruments, thus allowing for comparison. Consequently, this review has given particular consideration to a number of studies using the NPI and defining a case in the same way; clinically significant symptoms were signified as a score ≥4 on an individual item.

Biological, psychological, and social factors must be taken into account to understand the causes of NPS. Earlier research has shown that the presence of NPSs varies according to the severity of the disease and psychotropic drug use. In institutional settings, environmental issues may be particularly important and could influence the occurrence of NPSs.62,63 It has been demonstrated repeatedly that there are differences in the prevalence of NPSs between older people with and without dementia.5,64–66 Consequently, this review has applied rather narrow inclusion criteria to enhance comparability.

A majority of the studies report prevalence values on several NPSs. The presence of at least one NPS is consistently high (70–95%) with one exception, the study by Wancata et al.31 which reports a prevalence rate of only 38%. It should be noted that this study assessed only severe symptoms present during the interview, whereas the other studies assessed the presence of symptoms of various severity during a longer time period (1–4 weeks).

Agitation is a clinical concept that includes a number of different symptoms. It has been divided into aggressive behavior, physically nonaggressive behavior, and verbal/vocal behavior.48 According to this review, agitation symptoms are the most prevalent NPS, with prevalence rates up to around 80%. This is notable because agitation is associated with higher caregiver stress.21,67,68

The psychotic symptoms most commonly encountered in patients with dementia are delusions and hallucinations. This review corroborates earlier reports in that delusions are more common than hallucinations. The prevalence rates show great variation even though the results of the NPI studies are fairly consistent. In patients with dementia, it may be difficult to differentiate between the clinical symptoms, such as disorientation in time and place, misidentifications, and delusions, which may be one of the explanations for the large variability. Menon et al.’s study40 contrasts with the other studies in that only 1% of the participants manifested psychotic symptoms. The sample characteristics in this study do not differ substantially from the other studies. The divergent results may be caused by the properties of the assessment scale, psychotropic drug use, or regional variations. The last explanation is probably less likely because other studies including
<table>
<thead>
<tr>
<th>Citation (Year of Publication)</th>
<th>Country, Year of Data Collection</th>
<th>Study Design/Aim</th>
<th>N</th>
<th>Mean Age (SD), y</th>
<th>Female Sex, %</th>
<th>Dementia/Level of Dementia</th>
<th>PD Use, %</th>
<th>Assessment Scale</th>
<th>Agitation, %</th>
<th>Psychosis, %</th>
<th>Affective Symptoms and Apathy, %</th>
<th>Any NPSs, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>Country/Year</td>
<td>Design</td>
<td>Sample Characteristics</td>
<td>Score</td>
<td>Criteria/Measurements</td>
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<td></td>
<td>AD: 18</td>
<td>CSDD sum ≥ 6: 29</td>
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### Syndrome-Specific Scales

<table>
<thead>
<tr>
<th>Study</th>
<th>Country/Year</th>
<th>Design</th>
<th>Sample Characteristics</th>
<th>Score</th>
<th>Criteria/Measurements</th>
</tr>
</thead>
</table>

*AD, antidepressant; AES, Apathy Evaluation Scale; AGECAT, Automated Geriatric Examination for Computer Assisted Taxonomy; AMB, aberrant motor behavior; AMTS, Abbreviated Mental Test Scale; AP, antipsychotic; BEHAVE-AD, Behavioral Pathology in Alzheimer’s Disease rating scale; CDR, Clinical Dementia Rating Scale; CIS, Clinical Interview Schedule; CMAI, Cohen-Manfield Agitation Inventory; CSDD, Cornell Scale for Depression in Dementia; DMAS, Dementia Mood Assessment Scale; DSM-III-R, Diagnostic and Statistical Manual of Mental Disorders (Third Edition Revised); DSM-IV, Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition); EOD, early-onset dementia; GDS, Global Deterioration Scale; ICD-10, International Classification of Diseases, Tenth Revision; MADRS, Montgomery–Asberg Depression Rating Scale; MPDS, Psychogeriatric Dependency Rating Scale; NINCDS, National Institute of Neurological and Cognitive Disorders and Stroke—Alzheimer’s Disease and Related Disorders Association; NINCDS-AIREN, NINCDS—Association International pour la Recherche et l’Enseignement en Neurosciences; NPS, Neuropsychiatric Inventory; NPS, neuropsychiatric symptoms; OCS, observational cross-sectional study; OLS, observational longitudinal study; PD, psychotropic drug; PGDRS, Psychogeriatric Dependency Rating Scale; SCU, Special Care Unit.

*Clinically significant symptoms (NPI item score ≥ 4).
*Additional data provided by the author of the publication.
*Weighted mean.
*Two studies based on the same sample.
*Symptom occurring two to three times per week.
### Table 2
**Course of Neuropsychiatric Symptoms in Nursing Home Patients With Dementia**

<table>
<thead>
<tr>
<th>Study</th>
<th>Follow-up</th>
<th>N (complete follow-up)</th>
<th>Demographics (patients with complete follow-up)</th>
<th>Assessment Scale</th>
<th>Aggression/Agitation</th>
<th>Disinhibition</th>
<th>AMB</th>
<th>Delusion</th>
<th>Hallucination</th>
<th>Depression</th>
<th>Apathy</th>
<th>Any Symptom</th>
</tr>
</thead>
</table>
| Bergh et al (2011)22   | 5 Asm 16 mo | 96                     | Mean age: 84 y (SD 7)  
Female sex: 64%  
Female MMSE: 15 (SD 6)  
CDR1: 28%, CDR2 37%,  
CDR3: 35% | NPI (CSS)  
PE: 66–75%  
IN: 10–14%  
CP: 51% SU | PE: 67–79%  
IN: 9–19%  
CP: 50% SU | PE: 54–68%  
IN: 3–13%  
CP: 46% SU | PE: 55–66%  
IN: 11–14%  
CP: 45% SU | PE: 51–100%  
IN: 2–6%  
CP: 18% SU | PE: 52–85%  
IN: 7–13%  
CP: 46% SU | PE: 53–70%  
IN: 10–18%  
CP: 45% SU | PE: 83–89%  
IN: 20–44%  
CP: 92% |
| Wetzels et al (2010)23 | 2 y 117    | 5 Asm                   | Mean age: 82 y (SD 7)  
Female sex: 72%  
Female MMSE: 8 (SD 7) | NPI (CSS)  
PE: 53–62%  
IN: 11–18%  
CP: 54% SU | PE: 10–38%  
IN: 5–7%  
CP: 27% SU | PE: 42–63%  
IN: 10–16%  
CP: 50% SU | PE: 13–36%  
IN: 3–6%  
CP: 21% SU | PE: 25–50%  
IN: 0–4%  
CP: 10% SU | PE: 0–70%  
IN: 3–10%  
CP: 27% SU | PE: 36–55%  
IN: 9–27%  
CP: 53% SU | PE: 51–75%  
IN: 38–56%  
CP: 97% NPI total | |
| Selbaek et al (2008)44,a | 2 Asm 1 y 633 | 5 Asm       | Mean age: 84 y (SD 6)  
Female sex: 76%  
Female MMSE: 15 (SD 6)  
CDR1: 26%, CDR2 37%,  
CDR3: 37% | NPI (CSS)  
PE: 53%  
IN: 19% | PE: 50%  
IN: 16% | PE: 41%  
IN: 14% | PE: 44%  
IN: 17% | PE: 42%  
IN: 8% | PE: 42%  
IN: 13% | PE: 52%  
IN: 20% | PE: 79% |
| Testad et al 200545,i | 2 Asm 6 mo 87 | 5 Asm       | Mean age: 84 y (SD 6)  
Female sex: 72%  
Female MMSE: 8 (SD 0.9) | BARS  
BARS sum unchanged | PE: 14%  
IN: 6%  
CP: 27% Prevalence | PE: 73%  
IN: 11%  
CP: 27% | PE: 63%  
IN: 14%  
CP: 33% | PE: 67%  
IN: 21%  
CP: 48% | PE: 89%  
IN: 44% |
| Payne et al 200241    | 3 Asm 1 y 150 | 5 Asm       | Demographic data on complete cases not  
reported | CSDD (>-12) | | | | | | | |
| Wancata et al (2003)41,a | 2 Asm 6 mo 86 | 5 Asm       | Demographic data on complete cases not  
reported | CIS | PE: 73%  
IN: 11%  
CP: 27% | PE: 63%  
IN: 14%  
CP: 33% | PE: 67%  
IN: 21%  
CP: 48% | PE: 89%  
IN: 44% |
| Wagner et al (1995)46  | 3 Asm 4 mo 289 | 5 Asm       | Mean age: 80 y (55–96)  
Female sex: 73%  
Mean MMSE: 8 (SD 6) | MBPC-NH  
PU | PU | PU | PU |

Asm, assessments; AMB, aberrant motor behavior; BARS, Brief Agitation Rating Scale; CDR, Clinical Dementia Rating Scale; CIS, Clinical Interview Schedule; CP, cumulative prevalence; CSDD, Cornell Scale for Depression in Dementia; CSS, clinically significant symptom; IN, incidence (N with symptom/N without symptom on the previous assessment); MBPC-NH, Memory and Behavior Problems Check List—nursing home version; MMSE, Mini-Mental State Examination; NPI, Neuropsychiatric Inventory; PE, persistence (N with symptom/N with symptom on the previous assessment); PU, prevalence unchanged; SU, severity unchanged.

*Additional data provided by the author of the publication.
1Control group in randomized controlled trial.
2Demographic data from the 96 persons included in the control group at baseline.
3New calculations based on the published data performed.
4Any aggressive-psychotic symptom.”
The assessment of depression is especially challenging because there is great overlap between dementia symptoms and depressive symptoms. The global scales, such as NPI and the Behavioral Pathology in Alzheimer’s Disease rating scale, rely on mood symptoms, mainly sadness, whereas the symptom-specific scales, such as Cornell Scale for Depression in Dementia, also include other depressive symptoms, such as physical signs, behavioral disturbances, and vegetative symptoms in the assessment of depression. However, irrespective of whether symptom-specific scales or global scales have been applied, the prevalence rate of depressive symptoms is, with one exception, greater than 20%.

With a few exceptions, apathy is, together with agitation, the most common NPSs in our review. Among the global scales, only NPI assesses apathy. However, the high prevalence rate is confirmed when applying symptom-specific scales. Over the past few years apathy has been given increasing attention as an important and distinct symptom that should be addressed when planning treatment strategies.

Only a few studies have investigated the course of NPSs in NH patients with dementia. This review shows that NPSs are stable or are decreasing after admission to an NH. Alternatively, the high prevalence rate is explained by different intervals between assessment and different levels of dementia. The large variability of persistency for individual symptoms and the consistently high persistence of any single NPS underline the fact that the course of individual NPSs is intermittent, but that other NPSs tend to appear when one symptom remits. Therefore, the natural course of the symptoms may be difficult to predict. This is challenging when evaluating various approaches to the treatment of NH patients with dementia.

There are limitations to this review that should be acknowledged. The definition of an NH probably varies among different countries. We found this term to give the most homogeneous sample. However, other terms, such as long term care institutions or residential care, could have been chosen. A number of large studies using registry/administrative data from NH samples might have been included. However, previous publications have indicated that registry/administrative data on NPSs might be less valid than data collected as part of a clinical study, even though more optimistic conclusions have been drawn from other studies. We have been rather strict in demanding representativeness of the data, for the studies both on the course and the prevalence of NPSs. A somewhat less rigorous approach would have made data from the control groups of large clinical trials available for inclusion. Most of the studies rely on information from a close caregiver for the assessment of NPSs. Ideally, the assessment should have been based on a combination of observation, patient interview, and caregiver interview. However, this approach is seldom feasible. We have put particular emphasis on the recent studies using the NPI. All of these studies have been conducted in Europe. This may preclude generalization. Unfortunately, we have not been able to include any studies from Africa or South America.

Further studies on the course of NPSs are warranted. These studies should be large enough to follow up on the patients beyond 2 years. Preferably, established rating scales should be used to improve comparability. Important explanatory factors, such as type of ward, drug use, and level of dementia, should be included. Biological factors should be given more attention. NPSs are closely associated with increased suffering for the patients and higher burden on the caregivers. There is reason to believe that inappropriate drug prescription for the treatment of NPSs is widespread. A thorough understanding of the natural course of NPSs is vitally important when planning for the prevention and treatment of these symptoms.

**Conclusion**

Clinically significant NPSs are common in NH patients with dementia. Agitation and apathy are the most prevalent NPSs. The course of individual NPSs varies considerably, but exhibiting at least one NPS is a persistent feature. Large-scale studies with a follow-up beyond 2 years and with inclusion of relevant explanatory factors are warranted to inform treatment decision for this frail group of patients.

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