Pharmacological Treatment of Neuropsychiatric Symptoms of Dementia
A Review of the Evidence

Kaycee M. Sink, MD
Karen F. Holden, MD
Kristine Yaffe, MD

Up to 50% of community-dwelling elderly individuals older than 85 years have dementia, with Alzheimer disease (AD), vascular dementia, and dementia with Lewy bodies accounting for most cases.1,2 Although cognitive deficits are the clinical hallmark of dementing illnesses, noncognitive symptoms are common and can dominate disease presentation. These include an array of neuropsychiatric symptoms, such as agitation, aggression, delusions, hallucinations, repetitive vocalizations, and wandering, among other symptoms. Neuropsychiatric symptoms have been observed in 60% to 98% of patients with dementia,3-7 especially in later stages, and are associated with caregiver stress and depression, as well as reduced caregiver employment and income.8-11

Neuropsychiatric symptoms are also associated with increased hospital lengths of stay14 and commonly lead to nursing home placement.15-17 Federal expenditures for dementia are expected to triple in the next 10 years18 and 30% of the cost of caring for patients with AD is attributed directly to the management of neuropsychiatric symptoms.

Context
Neuropsychiatric symptoms of dementia are common and associated with poor outcomes for patients and caregivers. Although nonpharmacological interventions should be the first line of treatment, a wide variety of pharmacological agents are used in the management of neuropsychiatric symptoms; therefore, concise, current, evidence-based recommendations are needed.

Objective
To evaluate the efficacy of pharmacological agents used in the treatment of neuropsychiatric symptoms of dementia.

Evidence Acquisition
A systematic review of English-language articles published from 1966 to July 2004 using MEDLINE, the Cochrane Database of Systematic Reviews, and a manual search of bibliographies was conducted. Inclusion criteria were double-blind, placebo-controlled, randomized controlled trials (RCTs) or meta-analyses of any drug therapy for patients with dementia that included neuropsychiatric outcomes. Trials reporting only depression outcomes were excluded. Data on the inclusion criteria, patients, methods, results, and quality of each study were independently abstracted. Twenty-nine articles met inclusion criteria.

Evidence Synthesis
For typical antipsychotics, 2 meta-analyses and 2 RCTs were included. Generally, no difference among specific agents was found, efficacy was small at best, and adverse effects were common. Six RCTs with atypical antipsychotics were included; results showed modest, statistically significant efficacy of olanzapine and risperidone, with minimal adverse effects at lower doses. Atypical antipsychotics are associated with an increased risk of stroke. There have been no RCTs designed to directly compare the efficacy of typical and atypical antipsychotics. Five trials of antidepressants were included; results showed no efficacy for treating neuropsychiatric symptoms other than depression, with the exception of 1 study of citalopram. For mood stabilizers, 3 RCTs investigating valproate showed no efficacy. Two small RCTs of carbamazepine had conflicting results. Two meta-analyses and 6 RCTs of cholinesterase inhibitors generally showed small, although statistically significant, efficacy. Two RCTs of memantine also had conflicting results for treatment of neuropsychiatric symptoms.

Conclusions
Pharmacological therapies are not particularly effective for management of neuropsychiatric symptoms of dementia. Of the agents reviewed, the atypical antipsychotics risperidone and olanzapine currently have the best evidence for efficacy. However, the effects are modest and further complicated by an increased risk of stroke. Additional trials of cholinesterase inhibitors enrolling patients with high levels of neuropsychiatric symptoms may be warranted.

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EVIDENCE ACQUISITION

To identify articles, we systematically searched the MEDLINE database for English-language articles published between 1966 and July 2004, the Cochrane Database of Systematic Reviews, and performed a manual search of the reference lists of relevant retrieved articles. In MEDLINE, we combined the results of searches in 3 separate domains: dementia (MeSH terms dementia; Alzheimer disease; dementia, vascular; or Lewy body disease), neuropsychiatric symptoms (behavior; neurobehavioral manifestations; perceptual disorders; psychomotor disorders; mood disorders; or keyword neuropsychiatric), and drug therapy (cholinesterase inhibitors; tranquilizing agents; serotonin uptake inhibitors; anticonvulsants; valproic acid; benzodiazepines; trazodone; memantine; or psychotropic drugs). A total of 253 articles were identified through database searches. The titles and abstracts were read by 2 authors (K.M.S. and K.F.H.) and if the article appeared to meet inclusion criteria or if we were uncertain, the full study was obtained. A total of 187 articles were excluded based on reviewing titles and abstracts; therefore, 66 articles were obtained for full review and an additional 12 articles were identified in the manual search of references.

EVIDENCE SYNTHESIS

Typical Antipsychotics

Two meta-analyses covering 12 RCTs and 2 additional RCTs of typical (or conventional) antipsychotics were reviewed (Table 1 and Table 2). Trials varied in length from 17 days to 16 weeks. In an early meta-analysis of antipsychotic drugs (including haloperidol, thioridazine, thiothixene, chlorpromazine, trifluoperazine, and acetophenazine) covering 7 RCTs, the authors concluded that “18 of 100 patients benefited from neuroleptics (beyond that of placebo).” There was no difference in efficacy among the different typical antipsychotics on neuropsychiatric symptoms. An RCT of thioridazine vs placebo found significant improvements in agitation, but the trial was of poor quality with no mention of effect size, methods for randomization and allocation concealment, or the number of patients who completed the trial. A recent Cochrane review comparing haloperidol with placebo for the treatment of agitation in dementia concluded that aggression, but not agitation, behavioral symptoms as a whole, or clinical global impression of change was improved by treatment with haloperidol. Whether the statistically significant result for the aggression subscale represents a true benefit on aggression vs a chance finding in the setting of multiple hypothesis testing is unclear. In addition, the authors reported that dropouts due to adverse events, such as extrapyramidal symptoms and somnolence, were more than twice as likely to occur among those individuals randomized to haloperidol than placebo (odds ratio [OR], 2.5; 95% confidence interval [CI], 1.2-5.2). Lastly, perphenazine was not found to be of benefit compared with placebo in a 17-day trial of hospitalized patients.

There is no clear evidence that typical antipsychotic drugs are useful for treating neuropsychiatric symptoms defined broadly. There may be a slight benefit for haloperidol with aggression (doses of 1.2-3.5 mg/d) but it is unclear if this benefit outweighs the adverse effects, particularly extrapyramidal symptoms and sedation. There is no evidence that any one typical antipsychotic is more efficacious than another.

Atypical Antipsychotics

Atypical antipsychotics, also known as second-generation antipsychotics, include clozapine, olanzapine, risperidone, quetiapine, ziprasidone, and aripiprazole. Four of 6 RCTs of atypical
antipsychotics (olanzapine and risperidone) reported benefit in the treatment of neuropsychiatric symptoms of dementia (Table 1 and Table 2). These trials ranged from 24 hours to 12 weeks and were all conducted among nursing home residents, generally with moderate to severe dementia (mean Mini-Mental State Examination score, 5.5−13.7). The first trial of oral olanzapine reported that doses of 5 and 10 mg but not 15 mg were associated with a statistically significant decrease in the primary outcome of the sum of 3 Neuropsychiatric Inventory (NPI) core symptoms (agitation/aggression, hallucinations, and delusions). Only the 5-mg dose was associated with improvement in total NPI score (mean, 8.8 point improvement over placebo; range, 0−144; P = .005). Another trial comparing varying doses of olanzapine with placebo for patients with dementia-related psychosis found no significant difference between any of the doses and placebo in either of the primary outcomes. However, the authors show that the 7.5-mg dose was better than placebo in some secondary analyses. Finally, results from a 24-hour trial of intramuscular olanzapine (2.5 or 5.0 mg) reported a statistically significant improvement in the primary outcome at 2 hours in those individuals treated with either dose of olanzapine compared with placebo.

In 1 fixed-dose trial of risperidone, 45% of patients receiving 1.0 mg and 50% patients receiving 2.0 mg compared with 33% receiving placebo had at least 50% reduction in the Behavioral Pathology in Alzheimer Disease Rating Scale (BEHAVE-AD) score (P = .02 and P = .002 vs placebo, respectively). A 2.0-mg dose was not more efficacious than 1.0-mg dose and resulted in significantly higher adverse events, including extrapyramidal symptoms and somnolence. A subgroup analysis of patients who were not somnolent found similar benefit for risperidone vs placebo, suggesting that somnolence was not the mechanism for efficacy. Another trial of 229 patients did not report a significant benefit of risperidone (mean dose, 1.1 mg/d) in their primary outcome (≥30% reduction in BEHAVE-AD total score) but did report significant results for several secondary analyses. This trial found

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Design</th>
<th>No. of Patients</th>
<th>Length of Study</th>
<th>Funding Sponsor</th>
<th>Drug</th>
<th>Patient Residence</th>
<th>Dementia Type and Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Schneider et al, 1990</td>
<td>Meta-analysis of 7 RCTs</td>
<td>252</td>
<td>3-8 wk</td>
<td>NIH</td>
<td>Haloperidol, thioridazine, thioxetine, chlorpromazine, trifluoperazine, acethophenazine (75-267 mg/d in chlorpromazine equivalents)</td>
<td>Mostly nursing home</td>
<td>&quot;Senile&quot; dementia, vascular dementia</td>
</tr>
<tr>
<td>Lonergan et al, 2002</td>
<td>Meta-analysis of 5 RCTs</td>
<td>573</td>
<td>3-16 wk</td>
<td>UK National Health Service</td>
<td>Haloperidol (0.25-6.0 mg/d)</td>
<td>Community and nursing home</td>
<td>AD and vascular dementia: mild, moderate, and severe</td>
</tr>
<tr>
<td>Stotsky, 1984</td>
<td>RCT</td>
<td>358</td>
<td>4 wk</td>
<td>Not specified</td>
<td>Thioridazine (10-200 mg/d)</td>
<td>Nursing home and hospital</td>
<td>&quot;Senile&quot;: severity not specified</td>
</tr>
<tr>
<td>Pollock et al, 2002</td>
<td>RCT</td>
<td>54</td>
<td>17 d</td>
<td>NIH</td>
<td>Perphenazine (mean dose, 6.5 mg/d)</td>
<td>Geropsychiatry ward</td>
<td>AD, vascular dementia, mixed, dementia with Lewy bodies, MMSE score, 7.7</td>
</tr>
<tr>
<td>Atypical</td>
<td></td>
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</tr>
<tr>
<td>De Deyn et al, 1999</td>
<td>RCT</td>
<td>229</td>
<td>12 wk</td>
<td>Janssen</td>
<td>Risperidone (mean dose, 1.1 mg/d)</td>
<td>Nursing home</td>
<td>AD, vascular dementia, mixed MMSE score, 8.7</td>
</tr>
<tr>
<td>Katz et al, 1999</td>
<td>RCT</td>
<td>625</td>
<td>12 wk</td>
<td>Janssen</td>
<td>Risperidone (0.5, 1.0, or 2.0 mg/d)</td>
<td>Nursing home</td>
<td>AD, vascular dementia, mixed MMSE score, 6.6</td>
</tr>
<tr>
<td>Street et al, 2000</td>
<td>RCT</td>
<td>206</td>
<td>6 wk</td>
<td>Eli Lilly</td>
<td>Olanzapine (5, 10, or 15 mg/d)</td>
<td>Nursing home</td>
<td>AD MMSE score, 6.9</td>
</tr>
<tr>
<td>Meehan et al, 2002</td>
<td>RCT</td>
<td>204</td>
<td>24 h</td>
<td>Eli Lilly</td>
<td>Intramuscular olanzapine (2.5 or 5.0 mg)</td>
<td>Nursing home, hospital</td>
<td>AD, vascular dementia, mixed MMSE score, 11.8</td>
</tr>
<tr>
<td>Brodaty et al, 2003</td>
<td>RCT</td>
<td>345</td>
<td>12 wk</td>
<td>Janssen</td>
<td>Risperidone (mean dose, 0.95 mg/d)</td>
<td>Nursing home</td>
<td>AD, vascular dementia, mixed MMSE score, 5.5</td>
</tr>
<tr>
<td>De Deyn et al, 2004</td>
<td>RCT</td>
<td>652</td>
<td>10 wk</td>
<td>Eli Lilly</td>
<td>Olanzapine (1, 2.5, 5, or 7.5 mg/d)</td>
<td>Nursing home</td>
<td>AD MMSE score, 13.7</td>
</tr>
</tbody>
</table>

Abbreviations: AD, Alzheimer disease; MMSE, Mini-Mental State Examination; NIH, National Institutes of Health; RCT, randomized controlled trial.
### Table 2. Studies of Typical and Atypical Antipsychotics: Outcomes

<table>
<thead>
<tr>
<th>Source</th>
<th>Outcomes</th>
<th>Significance of Primary Outcome</th>
<th>Adverse Events and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typical</strong></td>
<td></td>
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</tr>
<tr>
<td>Schneider et al, 1995</td>
<td>Standardized effect size* (r = 0.18, ( P = .004 ); 18 of 100 benefited from neuroleptics</td>
<td>Yes</td>
<td>Possibly</td>
</tr>
<tr>
<td>Lonergan et al, 2002</td>
<td>&quot;Behavioral symptoms,&quot;* agitation, aggression, CGIC</td>
<td>No</td>
<td>Dropout due to adverse events more common in haloperidol than placebo group (OR, 2.6; 95% CI, 1.2-5.2)</td>
</tr>
<tr>
<td>Stotsky, 1984</td>
<td>Hamilton Anxiety Scale*</td>
<td>Yes</td>
<td>Not able to comment</td>
</tr>
<tr>
<td>Pollock et al, 2002</td>
<td>Neurobehavioral Rating Scale*</td>
<td>No</td>
<td>High dropout rate: 55% of perphenazine and 57% of placebo patients, ( P = .92 )</td>
</tr>
<tr>
<td><strong>Atypical</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>De Deyn et al, 1999</td>
<td>BEHAVE-AD (≥30% reduction),* CMAI, CGIC</td>
<td>No</td>
<td>Somnolence more common for risperidone than placebo (12.2% vs 4.4%)</td>
</tr>
<tr>
<td>Katz et al, 1999</td>
<td>BEHAVE-AD (≥50% reduction),* BEHAVE-AD psychosis subscale, CMAI, CGIC</td>
<td>Yes</td>
<td>27% Placebo and 42% in 2-mg risperidone group dropped out; primarily due to adverse events</td>
</tr>
<tr>
<td>Street et al, 2000</td>
<td>Sum of 3 NPI/NH core symptoms (agitation/aggression, hallucinations, delusions),* NPI/NH total, individual NPI items, BPRS 5 and 10 mg but not 15 mg had a significant decrease in the sum of core symptoms vs placebo; only 5 mg showed improvement in total NPI/NH score</td>
<td>Yes</td>
<td>18% of placebo group dropouts were due to adverse events vs 44% of olanzapine-treated patients; Somnolence was 5 to 8 times greater and gait disturbance 7.5 to 11 times more common for olanzapine than placebo; No difference in extrapyramidal symptoms across groups</td>
</tr>
<tr>
<td>Meehan et al, 2002</td>
<td>PANSS-EC,* CMAI, ACES Significant mean change in PANSS-EC 2 h after injection for both olanzapine doses vs placebo</td>
<td>Yes</td>
<td>Adverse events not significantly different across groups</td>
</tr>
<tr>
<td>Brodaty et al, 2003</td>
<td>CMAI total aggression score,* CMAI nonaggression score and subscale scores, BEHAVE-AD, CGIC</td>
<td>Yes</td>
<td>Serious adverse events occurred in 16.8% of risperidone vs 8.8% of placebo group, including 5 strokes and 1 TIA, all in the risperidone group</td>
</tr>
<tr>
<td>De Deyn et al, 2004</td>
<td>Psychosis subscale of NPI/NH,* CGIC,* NPI/NH total and item scores, BPRS total and item scores, occupational disruptiveness score</td>
<td>No</td>
<td>No difference in dropouts due to adverse events across groups (( P = .35 ), but weight gain, anorexia, and urinary incontinence more common with olanzapine; No difference in motor function or anticholinergic adverse effects</td>
</tr>
</tbody>
</table>

*Abbreviations: CI, confidence interval; OR, odds ratio; RCT, randomized controlled trial; TIA, transient ischemic attack. See Box for guide to neuropsychiatric symptom rating scales.

*Primary outcomes; all other outcomes listed are secondary outcomes.
no difference between risperidone and haloperidol in the primary outcome, although extrapyramidal symptoms were more common with haloperidol. In the most recent trial of risperidone, mean doses of 0.95 mg/d were found to be more efficacious than placebo on the primary outcome (4.4-point difference on Cohen-Mansfield Agitation Inventory aggression score [scale of 84 points], P < .001) and several secondary outcomes. In this trial, 16.8% of the patients randomized to risperidone (vs 8.8% of placebo group) had serious adverse events, including 5 strokes and 1 transient ischemic attack. All of the cerebrovascular events reported in the trial occurred with risperidone. However, all of these patients also had stroke risk factors (5 of 6 patients had atrial fibrillation).

Doses of 5 to 10 mg/d of olanzapine or 1.0 mg/d of risperidone appear to be at least modestly effective for treating neuropsychiatric symptoms of dementia in patients with AD or vascular dementia. The incidence of extrapyramidal symptoms appears to be low when receiving these doses of olanzapine and risperidone, but somnolence remains a concern. To our knowledge, there have been no published RCTs of clozapine, quetiapine, ziprasidone, or aripiprazole for neuropsychiatric symptoms of dementia. Furthermore, there have been no published RCTs designed to compare the efficacy of typical and atypical agents.

### Antidepressants

Of the 5 RCTs that have investigated the use of serotonergic antidepressants for the treatment of neuropsychiatric symptoms (sertraline, fluoxetine, citalopram, and trazodone), only the trial of citalopram found benefit (Table 3 and Table 4). This 17-day study of hospitalized patients found a 10-point change (of 168 points) in the Neurobehavioral Rating Scale for patients randomized to citalopram compared with a 2.3-point change for placebo (P < .001). Of the 7 subscales examined, only agitation and lability were significantly improved with citalopram compared with placebo. The trial had a high dropout rate, with more than half of patients in each group failing to complete the study, most commonly due to lack of efficacy. Lyketsos et al found sertraline to be effective in the treatment of depression among patients with dementia. However, there was no significant benefit of sertraline on neuropsychiatric symptoms. The authors did report that in subgroup analyses of full responders vs nonresponders (in terms of depression symptoms), full responders had significantly greater improvement on

### Table 3. Studies of Antidepressants and Mood Stabilizers: Study Characteristics

<table>
<thead>
<tr>
<th>Antidepressants</th>
<th>No. of Patients</th>
<th>Length of Study</th>
<th>Funding Sponsor</th>
<th>Drug</th>
<th>Patient Residence</th>
<th>Dementia Type and Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auchus and Bissey-Black, 1997</td>
<td>15†</td>
<td>6 wk</td>
<td>NIH and institutional grant</td>
<td>Fluoxetine (20 mg/d)</td>
<td>Community</td>
<td>AD, MMSE score, 15.2</td>
</tr>
<tr>
<td>Teri et al, 2000</td>
<td>73</td>
<td>16 wk</td>
<td>NIH</td>
<td>Trazodone (mean dose, 200 mg/d)</td>
<td>Community</td>
<td>AD, MMSE score, 13.5</td>
</tr>
<tr>
<td>Pollock et al, 2002</td>
<td>52</td>
<td>17 d</td>
<td>NIH</td>
<td>Citalopram (20 mg/d)</td>
<td>Hospital</td>
<td>AD, vascular dementia, mixed, dementia with Lewy bodies, MMSE score, 8.5</td>
</tr>
<tr>
<td>Lyketsos et al, 2003</td>
<td>44</td>
<td>12 wk</td>
<td>NIH</td>
<td>Sertraline (mean dose, 55 mg/d)</td>
<td>Community</td>
<td>AD, MMSE score, 16.9</td>
</tr>
<tr>
<td>Finkel et al, 2004</td>
<td>245</td>
<td>12 wk</td>
<td>Pfizer</td>
<td>Sertraline (mean dose, 126 mg/d)</td>
<td>Community</td>
<td>AD, MMSE score, 17.8</td>
</tr>
</tbody>
</table>

**Mood stabilizers**

<table>
<thead>
<tr>
<th>Source</th>
<th>No. of Patients</th>
<th>Length of Study</th>
<th>Funding Sponsor</th>
<th>Drug</th>
<th>Residence</th>
<th>Dementia Type and Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariot et al, 1998</td>
<td>51</td>
<td>6 wk</td>
<td>NIH, drugs donated by Ciba-Geigy Corp</td>
<td>Carbamazepine (mean dose, 304 mg/d)</td>
<td>Nursing home</td>
<td>AD, vascular dementia, mixed MMSE score, 6.0</td>
</tr>
<tr>
<td>Olin et al, 2001</td>
<td>21</td>
<td>6 wk</td>
<td>NIH</td>
<td>Carbamazepine (mean [SD] dose, 388 [44] mg/d)</td>
<td>Nursing home</td>
<td>AD, MMSE score, 6.0</td>
</tr>
<tr>
<td>Porsteinsson et al, 2001</td>
<td>56</td>
<td>6 wk</td>
<td>Alzheimer’s Association, NIH, and Abbott Laboratories</td>
<td>Divalprox sodium (mean [SD] dose, 826 [216] mg/d)</td>
<td>Nursing home</td>
<td>AD, vascular dementia, mixed MMSE score, 6.8</td>
</tr>
<tr>
<td>Tariot et al, 2001</td>
<td>172</td>
<td>6 wk</td>
<td>Abbott Laboratories</td>
<td>Divalprox sodium (median, 1000 mg/d)</td>
<td>Nursing home</td>
<td>AD, vascular dementia, mixed MMSE score, 7.4</td>
</tr>
<tr>
<td>Sival et al, 2002</td>
<td>42</td>
<td>3 wk</td>
<td>Van Hellen Foundation, government</td>
<td>Rapid-acting sodium valproate (480 mg/d)</td>
<td>Nursing home</td>
<td>AD, vascular dementia, mixed, Parkinson disease MMSE score, 11.4</td>
</tr>
</tbody>
</table>

**Abbreviations:** AD, Alzheimer disease; MMSE, Mini-Mental State Examination; NIH, National Institutes of Health. See Box for guide to abbreviations of neuropsychiatric symptom rating scales.

*All studies were randomized controlled trials.
†Number of patients in total study was 15, split between 3 groups (haloperidol, fluoxetine, or placebo); actual number of patients in each group was not reported.
Table 4. Studies of Antidepressants and Mood Stabilizers: Outcomes

<table>
<thead>
<tr>
<th>Source</th>
<th>Outcomes</th>
<th>Statistical</th>
<th>Clinical</th>
<th>Adverse Events and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antidepressants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auchus and Bissey-Black,32 1997</td>
<td>No positive treatment effect for CMAI,* BEHAVE-AD, CSI</td>
<td>No</td>
<td></td>
<td>Mean number of adverse events was higher for fluoxetine than for placebo (15.4 vs 7.3, ( P = .05 )). Patients receiving fluoxetine had worse CMAI score than patients receiving placebo at 6 wk. Also had a haloperidol group (data in Lonergan et al37) (Table 2)</td>
</tr>
<tr>
<td>Teri et al,33 2000</td>
<td>No difference between trazodone and placebo on CGIC,* CMAI, BRSD, RMBPC, ABID, SCB</td>
<td>No</td>
<td>No significant differences in adverse events or dropouts between trazodone and placebo Also included 34 patients in a haloperidol group (data in Lonergan et al20) (Table 2) and 41 patients in a behavioral-management group; there was no difference between any of the drug groups and placebo</td>
<td></td>
</tr>
<tr>
<td>Pollock et al,22 2002</td>
<td>Change in NRS total score* significantly greater for citalopram than placebo (10 vs 2.3 points; ( P &lt; .001 )) Of 7 subscales, *agitation and lability significantly improved with citalopram vs placebo (&lt;1 point on 7-point scale)</td>
<td>Yes</td>
<td>Possibly 52% Citalopram and 57% placebo patients dropped out; 30% dropouts due to adverse events, 50% due to lack of efficacy Also had a perphenazine group (Table 1)</td>
<td></td>
</tr>
<tr>
<td>Lyketsos et al,31 2003</td>
<td>No significant difference in total NPI or NPI-NM scores between groups</td>
<td>Depression: yes Agitation: no</td>
<td>No significant difference in adverse events between groups Primary goal was to treat depression in patients with dementia, for which sertraline was successful</td>
<td></td>
</tr>
<tr>
<td>Finkel et al,30 2004</td>
<td>No significant difference between groups on NPI,* CGIC, * CGIS, * CMAI, BEHAVE-AD, CSQ, 4-item NPI, 3-item BEHAVE-AD</td>
<td>No</td>
<td>12% Dropped out in both groups due to adverse events; diarrhea significantly more common with sertraline (27.4% vs 11.7%, ( P &lt; .05 )) All patients were also taking donepezil Behavior symptoms were a selection criteria for study</td>
<td></td>
</tr>
<tr>
<td><strong>Mood stabilizers</strong></td>
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</tr>
<tr>
<td>Tariot et al,34 1998</td>
<td>Agitation improved more in carbamazepine vs placebo group on all measures (BPRS,* CGIC, * OAS, BRSD); 77% of patients taking carbamazepine vs 21% placebo rated as improved by CGIC</td>
<td>Yes</td>
<td>Probably Significantly more adverse events in drug group than placebo (59% vs 29% ( P = .03 )); all 4 dropouts in drug group Physician titrating the dose was not blinded, but raters were</td>
<td></td>
</tr>
<tr>
<td>Olin et al,35 2001</td>
<td>No difference between groups on BPRS,* CGIC, * 21-item Ham-D; 56% carbamazepine and 58% placebo improved on CGIC</td>
<td>No</td>
<td>Adverse events were mild and occurred in 4 of 9 patients taking carbamazepine and 8 of 12 taking placebo</td>
<td></td>
</tr>
<tr>
<td>Porsteinsson et al,36 2001</td>
<td>No difference in the change in total scores between drug and placebo on BPRS,* OAS, BRSD, CMAI, CGIC</td>
<td>No</td>
<td>Adverse effects significantly more frequent with drug than placebo, ( P = .03 ); sedation most common adverse event (39% divalproex vs 11% placebo), also weakness, respiratory problems Physician titrating dose of drug was not blinded, but raters were</td>
<td></td>
</tr>
<tr>
<td>Tariot et al,37 2001</td>
<td>No difference between groups on BRMS* or BPRS; change in CMAI total score was slightly greater for drug group (−3.2 vs −1.0, ( P = .04 )); however, divalproex patients were slightly worse on CGIC than placebo (( P = .04 ))</td>
<td>No</td>
<td>Study was discontinued early due to significantly higher adverse event rate in the divalproex group (predominantly somnolence) Patients had to exhibit manic symptoms to be included</td>
<td></td>
</tr>
<tr>
<td>Sival et al,38 2002</td>
<td>No difference between groups on SDAS-9,* CGIS,* or nurses’ observations; benefit was reported for 3 of 14 GIP subscales</td>
<td>No</td>
<td>Data on specific adverse events not presented, but mean incidence of reported adverse events was low (0.17 divalproex vs 0.02 placebo) 14 of 42 patients did not have an MMSE score because dementia was too severe</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: MMSE, Mini-Mental State Examination. See Box for guide to abbreviations of neuropsychiatric symptom rating scales. *Primary outcomes; all other outcomes listed are secondary outcomes.
nonmood items of the NPI than nonresponders.

We conclude from these trials that although serotonergic agents are well tolerated, they do not appear to be very effective in the treatment of neuropsychiatric symptoms of dementia other than depression.39,40

Mood Stabilizers
Three RCTs have investigated valproate for neuropsychiatric symptoms.36-38 and 2 studies have investigated carbamazepine for neuropsychiatric symptoms (Table 3 and Table 4). Valproate does not appear to be effective for the treatment of neuropsychiatric symptoms of dementia whether in short- or long-acting preparations. In addition, valproate caused significantly more adverse events than placebo; sedation being the most common. Therefore, we do not recommend the use of valproate in the management of neuropsychiatric symptoms of dementia. Based on 2 small trials (1 positive34 and 1 negative35), there is currently not enough evidence of benefit to recommend the use of carbamazepine for treatment of neuropsychiatric symptoms, especially in light of the black box warning for hematologic toxicity and the potential drug-drug interactions between carbamazepine and other drugs commonly prescribed to elderly individuals. To our knowledge, there have been no published placebo-controlled RCTs of lithium for the treatment of neuropsychiatric symptoms of dementia.

Cholinesterase Inhibitors
Two meta-analyses41,42 and 6 additional RCTs43-48 of various cholinesterase inhibitors with neuropsychiatric symptom outcomes have been published (Table 5 and Table 6) with 5 of the 8 studies reporting statistically significant benefit. In a recent meta-analysis of cholinesterase inhibitors,42 the authors reported a small but statistically significant benefit from cholinesterase inhibitors with NPI scores (summary estimate 1.72-point improvement vs placebo on a scale of 0-120) but not Alzheimer Disease Assessment Scale, noncognitive portion scores. The statistically significant effect on NPI scores was most likely driven by 2 studies of metrifonate, which was never approved by the Food and Drug Administration for use in the United States due to toxicities.

A Cochrane review of galantamine for AD reported 2 RCTs of galantamine that included the NPI as an outcome.41 In one trial, there was no benefit of either galantamine 24-mg/d or 32-mg/d dose vs placebo. In the second trial, the intention-to-treat analysis found only the 16-mg/d dose to be significantly better than placebo (mean difference of 2.1 points, P=.03) with no benefit for the other doses.52 One additional RCT using 24-mg/d dose of galantamine also reported a

### Table 5. Studies of Cholinesterase Inhibitors and Memantine: Study Characteristics

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Design</th>
<th>No. of Patients</th>
<th>Length of Study</th>
<th>Funding Sponsor</th>
<th>Drug</th>
<th>Patient Residence</th>
<th>Dementia Type and Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholinesterase inhibitors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McKhitt et al, 2000</td>
<td>RCT</td>
<td>120</td>
<td>20 wk</td>
<td>Novartis</td>
<td>Rivastigmine (mean, 9.4 mg/d)</td>
<td>Community</td>
<td>Dementia with Lewy bodies MMSE score, 17.9</td>
</tr>
<tr>
<td>Feldman et al, 2001</td>
<td>RCT</td>
<td>290</td>
<td>24 wk</td>
<td>Pfizer</td>
<td>Donepezil (74%, taking 10 mg/d, 26% 5 mg/d)</td>
<td>Community, assisted living</td>
<td>AD MMSE score, 11.8</td>
</tr>
<tr>
<td>Tariot et al, 2001</td>
<td>RCT</td>
<td>208</td>
<td>24 wk</td>
<td>Pfizer and Eisai</td>
<td>Donepezil (mean, 9.5 mg/d)</td>
<td>Nursing home</td>
<td>AD MMSE score, 14.4</td>
</tr>
<tr>
<td>Erikjuntti et al, 2002</td>
<td>RCT</td>
<td>592</td>
<td>24 wk</td>
<td>Janssen</td>
<td>Galantamine (24 mg/d)</td>
<td>Community</td>
<td>Vascular dementia, mixed MMSE score, 20.5</td>
</tr>
<tr>
<td>Olm and Schneider, 2003</td>
<td>Meta-analysis of 2 RCTs</td>
<td>1364</td>
<td>12-20 wk</td>
<td>Meta-analysis funded by NIH, both studies analyzed funded by Janssen</td>
<td>Galantamine (8, 16, 24, 32 mg/d)</td>
<td>Community</td>
<td>Mild to moderate AD</td>
</tr>
<tr>
<td>Trinh et al, 2003</td>
<td>Meta-analysis of 16 RCTs</td>
<td>5529</td>
<td>6 wk-1 y</td>
<td>NIH and American Federation for Aging Research</td>
<td>Memantine, tacrine, galantamine, donepezil, rivastigmine</td>
<td>Community</td>
<td>Mild to moderate AD</td>
</tr>
<tr>
<td>Courtney et al, 2004</td>
<td>RCT</td>
<td>565</td>
<td>Up to 4 y (n = 4 in year 4)</td>
<td>UK National Health Service</td>
<td>Donepezil (5 or 10 mg/d)</td>
<td>Community</td>
<td>AD, mixed MMSE score, 19</td>
</tr>
<tr>
<td>Holmes et al, 2004</td>
<td>RCT</td>
<td>96</td>
<td>12 wk</td>
<td>Pfizer</td>
<td>Donepezil (10 mg/d)</td>
<td>Not specified</td>
<td>AD MMSE score, 21</td>
</tr>
<tr>
<td>Memantine</td>
<td>RCT</td>
<td>252</td>
<td>28 wk</td>
<td>Merz Pharmaceuticals and NIH</td>
<td>Memantine (20 mg/d)</td>
<td>Community</td>
<td>AD MMSE score, 7.9</td>
</tr>
<tr>
<td>Tariot et al, 2004</td>
<td>RCT</td>
<td>404</td>
<td>24 wk</td>
<td>Forest Laboratories</td>
<td>Memantine (20 mg/d)</td>
<td>Community</td>
<td>AD MMSE score, 10</td>
</tr>
</tbody>
</table>

Abbreviations: AD, Alzheimer disease; MMSE, Mini-Mental State Examination; NIH, National Institutes of Health; RCT, randomized controlled trial.

*Six trials contributed to analyses, but only 2 had data on neuropsychiatric symptoms.
Table 6. Studies of Cholinesterase Inhibitors and Memantine: Outcomes

<table>
<thead>
<tr>
<th>Source</th>
<th>Outcomes</th>
<th>Significance of Primary Outcome</th>
<th>Adverse Events and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholinesterase inhibitors</td>
<td>No difference in mean change in NPI-4 total score: no difference between rivastigmine and placebo</td>
<td>No</td>
<td>23% Dropout rate, no difference between groups; nausea, vomiting, anorexia, and somnolence significantly more common in rivastigmine vs placebo; no difference in serious adverse events</td>
</tr>
<tr>
<td>McKKeith et al,45 2000</td>
<td>No difference in mean change in NPI-4 total score: no difference between rivastigmine and placebo</td>
<td>No</td>
<td>8% of donepezil and 6% placebo dropped out due to adverse events; diarrhea, headache, and arthralgias occurred at least twice as frequently in donepezil vs placebo group</td>
</tr>
<tr>
<td>Tariot et al,46 2001</td>
<td>No difference in mean change in NPI-4 total score: no difference between rivastigmine and placebo</td>
<td>No</td>
<td>18% of placebo vs 11% donepezil dropped out due to adverse events; weight loss, abdominal pain, nausea, tremor, and myasthenia at least twice the frequency in donepezil vs placebo group</td>
</tr>
<tr>
<td>Trinh et al,42 2003</td>
<td>No difference in mean change in NPI-4 total score: no difference between rivastigmine and placebo</td>
<td>No</td>
<td>17% of placebo and 10% memantine group dropped out due to adverse events; agitation being most common reason; incidence of any adverse event no more than 2% higher for memantine than placebo</td>
</tr>
<tr>
<td>Courtney et al,47 2004</td>
<td>No difference in mean change in NPI-4 total score: no difference between rivastigmine and placebo</td>
<td>No</td>
<td>Significantly more dropouts in placebo group at 26 wk; 7% of donepezil vs 3% placebo dropped out due to adverse events</td>
</tr>
<tr>
<td>Holmes et al,44 2004</td>
<td>No difference in mean change in NPI-4 total score: no difference between rivastigmine and placebo</td>
<td>No</td>
<td>Global impression: no (LOCF) Behavioral: no</td>
</tr>
<tr>
<td>Reisberg et al,43 2003</td>
<td>LOCF analysis for CIBIC-plus not statistically different between groups (4.5 vs 4.8, P = .00); 28-week analysis was significantly better for memantine vs placebo (4.4 vs 4.7, P = .03); NPI change scores not significantly different between groups for either LOCF or 28-wk analyses (P = .33 and .60)</td>
<td>Yes, 28-wk analyses</td>
<td>17% of placebo and 10% memantine group dropped out due to adverse events, with agitation being most common reason; incidence of any adverse event no more than 2% higher for memantine than placebo</td>
</tr>
<tr>
<td>Tariot et al,45 2004</td>
<td>Mean change on NPI significantly better among patients receiving memantine (−0.1 vs +3.7; P = .002); CIBIC-plus score significantly better for memantine vs placebo (4.41 vs 4.66, P = .03); Global impression: no (LOCF) Behavioral: no</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; ITT, intention-to-treat; LOCF, last observation carried forward. See Box for guide to abbreviations of neuropsychiatric symptom rating scales.

*Primary outcomes; all other outcomes listed are secondary outcomes.
mean treatment difference in NPI scores of 2.2 points ($P<.05$). However, a 2-point difference on the NPI (range, 0-120) is unlikely to be clinically significant.

Four additional RCTs using donepezil have reported conflicting results. In a 24-week trial of 208 patients in a nursing home, there was no difference between treatment groups in the mean change in NPI scores. In subgroup analyses using the NPI items as categorical outcomes, only agitation/aggression was better for those individuals randomized to donepezil vs placebo (45% improved vs 28%, $P=0.04$). A 24-week trial of patients living in the community or assisted-living facilities found a slightly larger treatment difference of 5.6 points on the NPI in favor of donepezil ($P<.001$), with statistically significant benefit on the apathy, depression, and anxiety subscales. A similar magnitude of benefit was reported in a 12-week trial of 96 patients who had significant neuropsychiatric symptoms on enrollment. However, in the longest trial of cholinesterase inhibitors to date, there was no significant difference in the mean changes in NPI scores between those individuals randomized to donepezil (5 or 10 mg) or placebo at any time point up to 4 years of follow-up.

An RCT of patients with mild to moderate dementia with Lewy bodies found no difference in NPI scores between rivastigmine and placebo on either a 4-item NPI “dementia with Lewy bodies cluster” (delusions, hallucinations, apathy, and depression) or the full 10-item NPI. However, using a predefined cutoff of at least 30% improvement, significantly more patients receiving rivastigmine showed improvement compared with placebo (47.5% vs 27.9%, $P=.03$).

Although some trials of cholinesterase inhibitors have shown statistically significant differences, the magnitude of effect has been small and of questionable clinical significance. Most of the patients enrolled in the cholinesterase inhibitor trials had little neuropsychiatric symptoms with only 2 trials, requiring significant neuropsychiatric symptoms as part of the entry criteria.

### Other Drugs

Memantine, an N-methyl-D-aspartate receptor antagonist, was recently approved in the United States for the treatment of moderate to severe AD. Two RCTs of community-dwelling patients with moderate to severe AD have included neuropsychiatric symptoms as secondary outcomes (Table 5 and Table 6). In 1 trial, NPI scores were not significantly different between groups. In the other trial, there was a statistically significant difference in NPI change scores, largely because those individuals randomized to placebo got worse. Patients receiving memantine improved their NPI score by an average of 0.1 points, whereas patients receiving placebo declined 3.7 points ($P=.002$). This difference is of unclear clinical significance. We conclude that although memantine may be of benefit in cognitive and functional domains, there does not appear to be a clinically significant benefit in the treatment of neuropsychiatric symptoms for patients with moderate to severe AD.

Only 1 placebo-controlled RCT has been published on the use of benzodiazepines for the management of neuropsychiatric symptoms of dementia. This 24-hour trial of intramuscular olanzapine (2.5 mg or 5 mg) vs intramuscular lorazepam (1 mg) vs placebo is described in the section on atypical antipsychotics in Table 2. To our knowledge, there have been no published placebo-controlled RCTs on buspirone for the management of neuropsychiatric symptoms of dementia.

### INTERPRETATION OF DATA

#### CONTROVERSIES

There are several important methodological issues in neuropsychiatric symptom trials that limit the interpretation of the data and generate controversies on pharmacological management of neuropsychiatric symptoms of dementia. One controversy is how to define clinically significant improvement in neuropsychiatric symptoms. A particularly good example of this problem is highlighted with the cholinesterase inhibitor trials in which several trials reported very small but statistically significant changes in the NPI scores. Because there are no gold standard outcomes for neuropsychiatric symptoms, it is difficult to interpret small changes in scale scores and also to compare results across trials using different scales to measure neuropsychiatric symptoms (Box). To address this, we attempted to calculate standardized response means, but the vast majority of trials did not present the data needed to calculate such a measure. Clinically useful outcomes such as nursing home placement, quality of life, and caregiver burden and depression would enhance a clinician’s ability to interpret trial results and counsel patients and families regarding risks and benefits of treatment.

Another problem with the current literature is that most trials report on multiple outcomes from several different scales and subscales. What does it mean if the score was significantly improved on 1 scale but not on 4 others? This multiple comparison testing raises the concern for type I error. In addition, when reporting their results, many of the studies downplay the negative primary outcome while emphasizing positive secondary outcomes, especially in the abstract and discussion sections. The majority of these trials have been funded by the pharmaceutical industry. In this review, we have focused on the primary outcome as specified by the authors.

#### Clinical Dilemmas

The current evidence appears to suggest that, if behavioral interventions have failed, neuropsychiatric symptoms of dementia are best treated with the atypical antipsychotic agents (risperidone and olanzapine). However, the product label warning for cerebrovascular events (strokes and transient ischemic attacks) for these drugs creates a clinical dilemma. The pooled incidence of cerebrovascular events across 6 RCTs of risperidone in the patients with dementia (N = 1721) was re-

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ported to be 3.3% for risperidone vs 1.1% for placebo (P=.03). Similarly, combining data from 5 RCTs of olanzapine in 1656 patients with dementia-related psychosis revealed the incidence of cerebrovascular events in patients treated with olanzapine was significantly higher than in the placebo group (1.3% vs 0.4%, P = .02), even after adjustment for age, sex, and type of dementia. Therefore, physicians considering the prescription of risperidone or olanzapine should discuss the potential risks and benefits of such treatment with patients and their surrogate decision makers, especially for patients with risk factors for cerebrovascular disease.

Another area of clinical uncertainty pertains to the treatment of neuropsychiatric symptoms in patients with dementia with Lewy bodies, increasingly recognized as a common form of dementia. Very few trials regarding the treatment of neuropsychiatric symptoms have included patients with dementia with Lewy bodies. Therefore, no conclusions can be drawn regarding the efficacy of drug treatment for neuropsychiatric symptoms occurring in this setting. However, antipsychotics should be used cautiously in patients suspected to have dementia with Lewy bodies as these patients have been reported to have marked sensitivity, including life-threatening neuroleptic malignant syndrome, to typical and atypical antipsychotics.

Although dementia with Lewy bodies is characterized by fluctuating levels of impairment, hallucinations (often visual), and parkinsonism, the diagnosis may be overlooked, especially in later stages of the illness, until the patient experiences significant extrapyramidal symptoms while receiving an antipsychotic. If this occurs, the drug should be discontinued and a diagnosis of dementia with Lewy bodies entertained.

CONCLUSIONS AND PERSPECTIVES

Among the many drugs in use for the treatment of neuropsychiatric symptoms, we found only the atypical antipsychotics, risperidone and olanzapine, to have convincing evidence of efficacy for neuropsychiatric symptoms. In addition, trials of cholinesterase inhibitors have had remarkably consistent, albeit small positive effects on neuropsychiatric symptoms. However, it is clear that none of the drugs in use for neuropsychiatric symptoms offer a “magic pill.” The effect sizes have been modest at best, with treatment differences on the NPI scale of about 2 points for cholinesterase inhibitors and up to 8 points for olanzapine.

Potential Treatment Strategies

The management of neuropsychiatric symptoms in dementia should always begin with an assessment of the patient for medical (eg, pain and delirium) and environmental causes of the behavior. If the problem persists after these have been addressed, nonpharmacological interventions should be attempted before moving to drug therapy. Although a comprehensive review of nonpharmacological interventions is outside the scope of this article, several interventions have been shown in small studies to have varying degrees of success including but not limited to music therapy, aromatherapy, and pet therapy. Caregiver (either formal or informal) education is also an integral part of the management. Larger, well-designed, controlled trials are needed to assess the efficacy of such interventions.

Box. Neuropsychiatric Symptom Rating Scales

Agitated Behavior Inventory for Dementia (ABID)
Agitation-Calmness Evaluation Scale (ACES)
Alzheimer Disease Assessment Scale, noncognitive portion (ADAS-noncog)
Bech-Rafaelsen Mania Scale (BRMS)
Behavior Observation Scale for Intramural Psychogeriatric Patients (GIP)
Behavior Rating Scale for Dementia (by the Consortium to Establish a Registry for Dementia) (BRSD)
Behavioral Pathology in Alzheimer Disease Rating Scale (BEHAVE-AD)
Brief Psychiatric Rating Scale (BPRS)
Caregiver Burden Questionnaire (CBQ)
Clinical Global Impression of Change (1=very much improved to 7=very much worse) (CGIC)
Clinical Global Impression Scale (CGIS)
Clinicians Interview Based Impression of Change plus caregiver input (CIBIC-plus)
Cohen-Mansfield Agitation Inventory (CMAI)
Hamilton Rating Scale for Depression (Ham-D)
Iowa Caregiver Stress Inventory (CSI)
Neurobehavioral Rating Scale (0=not present to 7=extremely severe), derived from the Brief Psychiatric Rating Scale (NRS)
Neuropsychiatric Inventory (usually 10 items, 120 points) (NPI)
Neuropsychiatric Inventory-Nursing Home version (12 items, 144 points) (NPI-NH)
Neuropsychiatric Inventory minus 5 “mood” items (NPI-NM)
Overt Aggression Scale (OAS)
Positive and Negative Syndrome Scale-Excited Component (PANSS-EC)
Revised Memory and Behavior Problem Checklist (RMBPC)
Screen for Caregiver Burden (SCB)
Social Dysfunction and Aggression Scale (SDAS-9)
of nonpharmacological interventions are needed.

Until there are better answers, if drug therapy is to be instituted, there are 2 reasonable approaches to the management of neuropsychiatric symptoms, each with its merits and pitfalls. One approach would be to identify the target symptom and choose a drug that is known to treat a symptom most closely related to the one the patient is exhibiting. For example, one might use an antipsychotic for psychotic symptoms or an antidepressant for anxiety symptoms, such as repetitive vocalizations or pacing. Although this approach is intuitive, RCTs have not been designed to confirm that this approach is effective and secondary analyses suggest it might not be.

An alternative approach is one guided by the current state of evidence in combination with the goal of minimizing adverse effects (Figure). For example, although the evidence for cholinesterase inhibitors as effective treatments for neuropsychiatric symptoms is not as convincing as that for risperidone or olanzapine, we recommend beginning with a cholinesterase inhibitor if the patient is not already receiving one because they are well tolerated and may benefit cognition and function, even if they are not beneficial for neuropsychiatric symptoms. Additionally, typical antipsychotics do not appear in the suggested algorithm because there is less evidence of benefit and more adverse effects compared with the atypical antipsychotics.

Benzodiazepines are not part of the recommended management of neuropsychiatric symptoms and should be avoided, especially for long-term management. Although the only RCT us-

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**Figure. Recommended Algorithm for Management of Neuropsychiatric Symptoms of Dementia**

1. **Patient With Dementia and a Behavior Problem**
   - Evaluate for and Manage Delirium, Pain, Other Medical, and Environmental Causes for the Behavior
   - Evaluate the Behavior Problem
     - Specify the Problem Behavior (eg, “Agitation” Is Less Useful Than “Screaming,” “Hitting When Bathed”)
     - Identify What Brings It on and What Makes It Go Away
     - Identify Whom the Behavior Is Bothering (The Patient? The Caregiver/Staff? Other Patients?)
   - Begin Nonpharmacological Management* Directed at Specific Behavior
     - Educate Caregivers
   - No Does the Patient Have Symptoms of Depression or Anxiety?
     - Yes Monitor for Recurrence
     - No Is the Patient Receiving a Cholinesterase Inhibitor?
       - Yes Begin Trial of Cholinesterase Inhibitor With or Without Memantine
       - No Behavior Problem Improved?
         - Yes Begin Trial of SSRI
         - No Monitor for Recurrence and Adverse Drug Events
       - Begin Trial of Atypical Antipsychotic Medication†
         - No Behavior Problem Improved?
           - Yes Monitor for Extrapyramidal Symptoms and Sedation
             - Attempt Medication Taper Every 6 mo
           - No Consider Trial of Carbamazepine
             - Recommend Referral to a Specialist
   - No Behavior Problem Improved?
     - Yes Monitor for Recurrence and Adverse Effects
1. SSRI indicates selective serotonin reuptake inhibitor.
   *Music therapy, aromatherapy, pet therapy, or other approaches.
   †Caution is advised in patients with dementia with Lewy bodies.
being a benzodiazepine for acutely agitated patients with dementia (Table 2).

They did not report a significant difference in adverse events in the 24 hours after intramuscular injection, case reports and anecdotal evidence suggest that benzodiazepines lead to increased confusion, falls, and may paradoxically increase agitation in patients with dementia.

Consistent with this information, the report published by the Expert Consensus Panel for Agitation in Dementia generally recommended against the use of benzodiazepines except for short-term or occasional use for anxiety symptoms.

In addition, no psychoactive medication prescribed to treat neuropsychiatric symptoms of dementia should be continued indefinitely and attempts at drug withdrawal should be made regularly.

Many patients who are prescribed antipsychotics for neuropsychiatric symptoms will no longer need them when the drug is later discontinued.

Physical restraints should be avoided as they are associated with injury, not protection, of patients who are confused.

Directions for Future Research

Because there is no “magic pill” for neuropsychiatric symptoms of dementia, it is especially important to continue efforts to better understand the pathophysiology of the symptoms and whether they vary by dementia type; perform high-quality trials of nonpharmacological treatments, especially in combination with drug therapy; include nursing home placement and caregiver outcomes in trials; and support non–industry-funded trials aimed specifically at treating patients with neuropsychiatric symptoms. The results from the National Institute of Mental Health–funded Clinical Anti-psychotic Trials of Intervention Effectiveness trial will be particularly valuable.

This trial is a multicenter RCT comparing risperidone, olanzapine, quetiapine, clozapine, and placebo for up to 36 weeks for the treatment of psychosis and agitation in patients with AD. This will be the first and longest placebo-controlled, head-to-head trial of atypical antipsychotic drugs.

Author Affiliations: Sticht Center on Aging, Department of Internal Medicine, Wake Forest University School of Medicine, Winston-Salem, NC (Dr Sink); Division of Geriatrics (Dr Sink), Department of Psychiatry, University of California, San Francisco, and San Francisco Veterans Affairs Medical Center (Dr Yaffe), San Francisco.

Author Contributions: Drs Sink, Holden, and Yaffe had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Sink, Yaffe. Acquisition of data: Sink, Holden. Analysis and interpretation of data: Sink, Holden, Yaffe. Drafting of the manuscript: Sink, Holden. Critical revision of the manuscript for important intellectual content: Sink, Yaffe. Obtained funding: Sink, Yaffe. Administrative, technical, or material support: Yaffe. Study supervision: Yaffe.

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