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Neuroleptic and benzodiazepine use in long-term care in urban and rural Alberta: characteristics and results of an education intervention to ensure appropriate use

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ABSTRACT

Objectives: To examine the use of psychotropic drugs in 24 rural and urban long-term care (LTC) facilities, and compare the effect of an education intervention for LTC staff and family members on the use of psychotropic drugs in intervention versus control facilities.

Methods: Interrupted time series with a non-equivalent no-treatment control group time series. Data on drug use were collected in 24 Western Canadian LTC facilities (10 urban, 14 rural) for three 2-month time periods before and after the intervention. Pharmacy records were used to collect data on drug, class of drug, dose, administration, and start/stop dates. Chart reviews provided demographics, pro re nata (prn) use, and indications for drug use. Subjects comprised 2443 residents living in the 24 LTC facilities during the 1-year study. An average of 796.33 residents (32.7%) received a psychotropic drug. An education intervention on psychotropic drug use in LTC was offered to intervention physicians, nursing staff, pharmacists and family members.

Results: Approximately one-third of residents received a psychotropic drug during the study, often for considerable lengths of time. A minority of psychotropic drug prescriptions had a documented reason for their use,
and 69.5% of the reasons would be inappropriate under Omnibus Budget Reconciliation Act (OBRA) legislation. Few psychotropic drug prescriptions were discontinued or reduced during the study. More urban LTC residents received neuroleptics and benzodiazepines than their rural counterparts (26.1% vs. 15.7%, and 18.0% vs. 7.6%, respectively). The education intervention did not result in any significant decline in the use of these drugs in intervention facilities.

**Conclusion**: The results suggest substantial use of psychotropic drugs in LTC, although rural LTC residents received approximately half the number of psychotropic drugs compared with urban residents. A resource-intensive intervention did not significantly decrease the use of psychotropics. There is a need for better monitoring of psychotropic drugs in LTC, particularly given that voluntary educational efforts alone may be ineffective agents of change.

**Key words**: benzodiazepines, antipsychotic agents, nursing homes, continuing medical education, aged

**Introduction**

The Omnibus Budget Reconciliation Act (OBRA), implemented in 1987 in the U.S.A., introduced regulations for the use of psychotropics (particularly antipsychotics) in long-term care (LTC) facilities, and resulted in substantial decreases in antipsychotic drug use in LTC facilities in the U.S.A. (Lantz *et al.*., 1996; OBRA, 1987; Semla *et al.*., 1994; Snowden and Roy-Byrne, 1998). Before OBRA-87, almost 40% of LTC residents were receiving antipsychotics (Avorn *et al.*., 1989; Buck, 1988). By the 1990s, the percentage was in the mid-teens (Hughes *et al.*., 2000; Llorente *et al.*., 1998), similar to that in many European countries (Hughes *et al.*., 2000; Ruth *et al.*., 2001).

In Canada, however, no such regulations exist at either the provincial or national level. There is also little research on the use of psychotropics (such as neuroleptics) in Canadian LTC facilities, and what little research exists has raised concerns over possible overuse. For example, studying nursing home residents in Ontario, Conn *et al.* (1999) found that 29.8% of residents received neuroleptics, and 22.5% received benzodiazepines. More recently, in another Ontario study, Bronskill *et al.* (2004) found that 24% of residents admitted to LTC with no previous neuroleptic exposure were prescribed a neuroleptic within 1 year of admission. A study in Alberta (Hagen *et al.*., 2005) recently found that an average of 31.3% of LTC residents received neuroleptics, and that up to 36.9% of residents received neuroleptics in those facilities that were experiencing resident relocation.

Preliminary evidence indicating substantial use of psychotropic drugs in Canadian LTC facilities has led to the suggestion of more careful monitoring of
psychotropic drugs in LTC care, and increased provider education on the use of these drugs (Bronskill et al., 2004; Hagen et al., 2005). At least two studies in the U.S.A. (Avorn et al., 1992; Meador et al., 1997) have demonstrated that provider education (both physicians and nursing staff) reduces psychotropic drug use in LTC facilities. Both of these studies took place in the context of existing OBRA-87 regulations. Whether such education initiatives would have the same effect in Canada, which lacks such regulations, is unknown. It is also not known how involving both LTC facility pharmacists and resident family members in such education interventions would impact the use of these drugs.

We have found no previous research comparing the use of psychotropic drugs in urban and rural LTC facilities. Given that many of the LTC facilities in Southern Alberta are in smaller rural communities, we considered it important to compare the use of psychotropic drugs in rural LTC sites with their larger urban counterparts.

Therefore, the purpose of this study was twofold: (1) to examine the characteristics of psychotropic drug (neuroleptics, benzodiazepines and trazodone) prescribing and administration in 24 rural and urban LTC facilities in Southern Alberta, and to compare the findings with international data and legislation; and (2) to compare the effect of an education intervention involving physicians, nursing staff, pharmacists and family members on the use of psychotropics in facilities that received such an intervention with those that did not. The primary hypothesis for the study was: the intervention facilities will demonstrate a greater decrease post-intervention in the percentage of residents receiving psychotropics and dosages of psychotropics compared with the control facilities.

**Methods**

**Research design**

In Southern Alberta a significant number of physicians deliver care in more than one LTC facility. The study facilities were therefore divided evenly into either experimental or control status on the basis of geographic separation to minimize the spread of intervention information by physicians or LTC staff from experimental to control LTC facilities. After allocation we had 12 intervention facilities (five urban and seven rural) and 12 control facilities (five urban and seven rural). Data on psychotropic drug use were collected for three 2-month periods prior to the education intervention, and for three 2-month periods after the intervention, using an interrupted time series with a nonequivalent no-treatment control group design (see Figure 1). The three pre-education and three post-education data collection periods were chosen to allow for an assessment
of stability of psychotropic drug use prior to the education, and to allow for an assessment of the impact of the education both immediately after the sessions (2 months) and for several months afterwards (4 and 6 months).
**Intervention**

The education intervention was based on an algorithm developed by the research team and delivered to one of four target groups: physicians, nurses, facility pharmacists and family members. The two-page algorithm reviewed non-pharmacological approaches for managing agitation in LTC and offered appropriate guidelines for psychotropic drug use in LTC, based upon a review of existing guidelines (Gurvich and Cunningham, 2000; OBRA, 1987; Patterson et al., 1999). The education sessions consisted of presenting the algorithm to the four target groups, but they were modified slightly according to the group. For example, pharmacological aspects of the algorithm were emphasized with pharmacists, behavioral interventions and case-studies were emphasized with nursing staff, and the information was made more basic for family members. The algorithm is available from the authors.

All physicians responsible for residents in the LTC facilities who had prescriptions for neuroleptics and/or benzodiazepines were invited to participate in the physician education, which consisted of a 30-minute academic detailing session offered by a trained study pharmacist. All regular (full- and part-time) nursing staff in the LTC facilities, including personal care attendants, licenced practice nurses and registered nurses, were invited to two 30–45-minute education sessions. In addition, each intervention facility pharmacist received a 30-minute education session with a study pharmacist. All physicians, nursing staff and pharmacists were given laminated copies of the algorithm, and all nursing stations in the facilities received copies to post in stations and place in resident charts. All LTC staff were made aware of the nature of the research project and the relationship between the research and the education sessions.

After approximately 3 months of educational activities, 33 out of 41 (80.5%) of eligible rural physicians had received an education session. The urban physicians proved much more difficult to recruit, and despite repeated invitations, only 16 out of 43 (37.2%) eligible urban physicians finally agreed to participate in the voluntary education session. However, these 16 participating physicians were caring for 78.5% (688 out of 873) of the residents receiving neuroleptics and benzodiazepines in the urban intervention LTC facilities. One hundred and seven out of 137 (78.1%) regular (part- or full-time) nursing staff in the urban intervention facilities received the education intervention delivered by trained registered nurses, as did 98 out of 113 (86.7%) regular nursing staff in the rural intervention facilities. All the pharmacists in both urban (five out of five) and rural (seven out of seven) facilities received education.

Finally, posters, word of mouth and announcements were used to advertise the educational sessions for interested family members of persons with dementia living in the intervention LTC facilities. These 45-minute sessions, presented by trained registered nurses using standardized materials, presented in layman’s terms the research project and the use of psychotropic medications in LTC.
Table 1. Characteristics of participating long-term care (LTC) facilities

<table>
<thead>
<tr>
<th>FACILITY CHARACTERISTIC</th>
<th>INTERVENTION FACILITIES (n = 12)</th>
<th>CONTROL FACILITIES (n = 12)</th>
<th>TEST FOR SIGNIFICANT DIFFERENCES *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean size (number of beds) of facilities (range)</td>
<td>99.17 (21–248)</td>
<td>93.25 (15–221)</td>
<td>$t(22) = -0.20, p = 0.84$ (two-tailed)</td>
</tr>
<tr>
<td>Mean age (years) of facility</td>
<td>25.18</td>
<td>33.00</td>
<td>$t(21) = 1.64, p = 0.12$ (two-tailed)</td>
</tr>
<tr>
<td>Case mix index (index of resident acuity)</td>
<td>112.33</td>
<td>100.72</td>
<td>$t(18) = -1.97, p = 0.064$ (two-tailed)</td>
</tr>
<tr>
<td>Mean number of recreation therapists (full-time equivalent) per resident</td>
<td>0.089</td>
<td>0.047</td>
<td>$t(21) = -0.56, p = 0.58$ (two-tailed)</td>
</tr>
<tr>
<td>Mean number of volunteer hours per month per resident</td>
<td>4.47</td>
<td>3.10</td>
<td>$t(20) = -1.02, p = 0.32$ (two-tailed)</td>
</tr>
<tr>
<td>Mean number of falls per resident (over 6 months)</td>
<td>1.00</td>
<td>0.91</td>
<td>$t(19) = -0.36, p = 0.72$ (two-tailed)</td>
</tr>
<tr>
<td>Percent (and number) of facilities by their ownership and administration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>25.0 (3)</td>
<td>41.7 (5)</td>
<td>$\chi^2(2, N = 24) = 1.53, p = 0.47$</td>
</tr>
<tr>
<td>Public</td>
<td>66.7 (8)</td>
<td>41.7 (5)</td>
<td></td>
</tr>
<tr>
<td>Charity</td>
<td>8.3 (1)</td>
<td>16.7 (2)</td>
<td></td>
</tr>
<tr>
<td>Percent (and number) of facilities where pharmacist is hired by</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility</td>
<td>25.0 (3)</td>
<td>6.7 (2)</td>
<td>$\chi^2(2, N = 24) = 1.60, p = 0.45$</td>
</tr>
<tr>
<td>Health region</td>
<td>50.0 (6)</td>
<td>33.3 (4)</td>
<td></td>
</tr>
<tr>
<td>Private drug store</td>
<td>25.0 (3)</td>
<td>50.0 (6)</td>
<td></td>
</tr>
</tbody>
</table>

*None of the differences are statistically significant at the 0.05 level.

Seventy-three family members from five urban facilities and 63 from rural facilities attended education sessions.

Sample and setting

The 24 LTC facilities participating in the study were located in Southern Alberta. Ten of these LTC facilities (total beds = 1666) were from the urban center of Calgary, the other 14 LTC facilities (total beds = 648) were from two surrounding rural health regions. Table 1 provides the characteristics of participating LTC facilities. There were no statistically significant differences between the characteristics of the intervention and the control facilities.

In the 24 facilities, there were 2314 available beds in total. Because of a small number of resident admissions (due to discharges or deaths) during each of the 2-month data collection periods, an average of 2443 residents lived in the 24 facilities during the six 2-month data collection periods. For all six time periods, an average of 32.7% (796.33 out of 2433) of residents were identified as receiving a psychotropic drug (neuroleptic, benzodiazepine or trazodone). The average age of residents was 84.51 years, the median length of stay was 93 weeks (1.79 years), 72.3% of residents were female, and 39.3% had a diagnosis of dementia. Table 2 compares the characteristics of LTC residents
Table 2. Characteristics of long-term care (LTC) residents receiving psychotropic medications

<table>
<thead>
<tr>
<th>Resident Characteristic</th>
<th>Residents in Intervention Facilities</th>
<th>Residents in Control Facilities</th>
<th>Test for Significant Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>84.59 (N = 735)</td>
<td>84.43 (N = 693)</td>
<td>t(1416) = 0.32, p = 0.75 (two-tailed)</td>
</tr>
<tr>
<td>Mean (median) length of stay (weeks)</td>
<td>143.20 (92.00) (N = 735)</td>
<td>151.38 (94.00) (N = 693)</td>
<td>t(1435) = −0.81, p = 0.42 (two-tailed)</td>
</tr>
<tr>
<td>Gender (% (n))</td>
<td>Male 26.3 (192)</td>
<td>29.2 (200)</td>
<td>χ²(1, N = 1416) = 1.44, p = 0.23</td>
</tr>
<tr>
<td></td>
<td>Female 73.7 (538)</td>
<td>70.8 (486)</td>
<td></td>
</tr>
<tr>
<td>No. residents per room (% (n))</td>
<td>One 31.4 (139)</td>
<td>26.7 (135)</td>
<td>χ²(1, N = 1445) = 6.88, p = 0.009</td>
</tr>
<tr>
<td></td>
<td>Two 67.7 (299)</td>
<td>72.3 (365)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Three or more 0.9 (4)</td>
<td>1.0 (5)</td>
<td></td>
</tr>
<tr>
<td>Diagnosis of dementia (% (n))</td>
<td>57.4 (426)</td>
<td>64.2 (451)</td>
<td>χ²(1, N = 1445) = 6.88, p = 0.009**</td>
</tr>
<tr>
<td>Diagnosis of Parkinson’s disease (% (n))</td>
<td>6.9 (51)</td>
<td>4.3 (30)</td>
<td>χ²(1, N = 1445) = 4.61, p = 0.032**</td>
</tr>
<tr>
<td>Diagnosis of mental disorder (% (n))</td>
<td>9.7 (72)</td>
<td>9.2 (65)</td>
<td>χ²(1, N = 1444) = 0.093, p = 0.76</td>
</tr>
<tr>
<td>Residents seen by psychogeriatric/mental health team (% (n))</td>
<td>21.4 (142)</td>
<td>20.5 (130)</td>
<td>χ²(1, N = 1296) = 0.15, p = 0.70</td>
</tr>
</tbody>
</table>

*Neuroleptics, benzodiazepines and/or trazodone
**Significance < 0.05

receiving psychotropics in intervention and control facilities. The only small but statistically significant difference between the residents in intervention versus control facilities was in the percentage of residents who had a diagnosis of dementia or Parkinson’s disease (see Table 2).

Methods of measurement

All data collection was commenced 6 months after the education intervention in the five urban and seven rural intervention facilities (Figure 1). Initially, the facility pharmacy generated a computerized report of all prescriptions for each resident who was receiving neuroleptics, benzodiazepines and/or trazodone, for each of the six 2-month data collection time periods. Trazodone was included as a psychotropic drug as it is often used for sedation or to reduce agitation in patients with dementia, and was also included in a Canadian Consensus Conference on Dementia (Patterson et al., 1999). Other antidepressants were not examined in this study as they are not typically used for the control of common behavioral symptoms associated with dementia, such as agitation. For each prescription, the report contained information on resident I.D. number (names were blacked...
out), resident room number, drug, drug class, dose, administration (prn vs. regular) and start/stop dates (length of time on prescription).

Trained research assistants conducted chart reviews on each resident identified as having received neuroleptics, benzodiazepines and/or trazodone for any of the six 2-month data collection periods. In these reviews we abstracted the drug dosages administered prn, resident’s age, gender, room situation (e.g. single or semiprivate), length of stay, diagnoses, indications for administration of the psychotropic drug, and consultations by a psychogeriatric assessment/consulting team. All dosages of neuroleptics and benzodiazepines were converted into chlorpromazine (CPZ) and diazepam (DZP) equivalencies, respectively.

Each participating LTC facility manager provided information on the number of resident beds, age of facility, ownership of facility, case-mix index (resident acuity), pharmacist location, number of resident falls, and recreation therapist and volunteer hours.

**Statistical analysis**

For most research questions, simple descriptive statistics were used, such as frequencies, cross-tabulations and means. For descriptive statistics, all facilities and all time periods were used to account for the variability between facilities and time periods. We used t-tests and $\chi^2$-tests to determine significant differences in resident and facility characteristics between control and intervention groups. Repeated measures analysis of variance (R-ANOVA) was used to test for differences in continuous level outcome variables (i.e. total CPZ and DZP equivalency dosages given) for pre- and post-intervention comparisons between control and intervention residents. The upper distribution tails of the continuous level outcome variables were very long, so we used winsorized means to remove extreme outliers without creating missing data, whereby values above the 99th percentile were set to values at the 99th percentile (Wilson, 2003). McNemar tests were run on each of the two groups (control and intervention) independently for nominal-level outcome variables (i.e. frequencies of residents receiving psychotropics) for the pre- and post-intervention time periods, and their results compared between the two groups. $\chi^2$-tests were used, where appropriate, to test for overall differences in categorical level data between groups, and t-tests were used for overall differences in continuous level data.

**Ethical considerations**

Because of the number of health regions (three) and universities (two) involved in the project, the research received ethics approval from a total of five research ethics boards. As the research also entailed the use of pre-existing health information without always being able to obtain informed consent (i.e. from
persons with dementia), the research also conformed to regulations laid out by the Alberta Health Information Act.

**Results**

**Characteristics of psychotropic drug use in LTC facilities**

**PERCENTAGE OF LTC RESIDENTS RECEIVING PSYCHOTROPIC DRUGS**

For all facilities and all six time periods, an average of 32.7% (796.33 out of 2433) of LTC residents received a neuroleptic, a benzodiazepine and/or trazodone, with a range between times and facilities of 26.9% to 37.32%. For all facilities and all time periods, an average of 23.2% (564.46 out of 2433) of LTC residents received a neuroleptic drug, with a range of 17.5% to 28.7%. Figure 2 shows the changes in the percentage of LTC residents receiving neuroleptics over time in control and experimental facilities.

For all facilities and all six time periods, an average of 15.4% (375.67 out of 2433) of LTC residents received a benzodiazepine, with a range of 13.5% to 17.5%. Figure 2 shows the changes in the percentage of LTC residents receiving benzodiazepines in control and experimental facilities. Only an average of 2.1% (51.67/2433) of all residents in all time periods received trazodone, with a range between 1.4% and 2.6%. Because of the small percentage of residents receiving trazodone, no further analyses were conducted on trazodone.

**PROPORTION OF PRESCRIPTIONS WRITTEN AS PRN**

For all facilities and all time periods, an average of 27.4% (400 out of 1459) of all neuroleptic prescriptions were written and administered on a prn basis. By contrast, more than double – an average of 64.5% (648 out of 1004) – the number of benzodiazepine prescriptions were written and administered on a prn basis.

**DOCUMENTATION OF REASONS FOR ADMINISTRATION OF NEUROLEPTICS AND BENZODIAZEPINES**

For all facilities and time periods, 33.5% (488 out of 1455) of prescriptions for neuroleptics had documentation on why the neuroleptic was being used, and 39.4% (394 out of 999) of prescriptions for benzodiazepines had similar documentation. Among the reasons that were documented, agitation was the most common reason given for neuroleptics (40.7% of all reasons), followed by verbal aggression (23.8%), physical aggression (11.4%), paranoia (10.4%), hallucinations (8.3%) and anxiety (3.9%). Agitation was also the most common reason given for benzodiazepines (51.0% of all reasons), followed by anxiety (25.3%), insomnia (10.9%), aggression (7.3%) and seizures (3.8%).
Percent of residents given neuroleptic medications in experimental vs. control facilities (Average N of residents for T1-T6 = 2433)

![Graph showing percentage of residents receiving neuroleptic medications over time with intervention and control facilities compared.](image)

Percent of Residents Receiving Benzodiazepines in Control Vs. Experimental Facilities (Average N of residents for T1-T6 = 2433)

![Graph showing percentage of residents receiving benzodiazepines over time with intervention and control facilities compared.](image)

Fig. 2. Percent of residents given neuroleptic and benzodiazepine medications in intervention vs. control facilities: Time 1 to Time 6.

**Types of Neuroleptics and Benzodiazepines**

Of all neuroleptic prescriptions, 79.7% (1092 out of 1371) were atypical antipsychotics. Risperidone was the most commonly prescribed neuroleptic, accounting for over half (52.7%) of all neuroleptic prescriptions. The next most commonly prescribed neuroleptics were olanzapine (14.8%), haloperidol (12.8%), quetiapine (12.7%) and loxapine (3.1%). Lorazepam was by far the
most commonly prescribed benzodiazepine, comprising 72.7% (729 out of 1002) of such prescriptions. Less-prescribed benzodiazepines included oxazepam (10.6%), temazepam (7.8%), clonazepam (6.4%) and diazepam (1.5%).

LENGTH OF TIME ON DRUGS AND NUMBER OF PRESCRIPTIONS
For all residents and all time periods, the winsorized average (mean) length of time for administration of neuroleptic prescriptions \((n=1017)\) was 52.78 weeks (1.02 years), with a median length of time of 34 weeks (0.65 years). For benzodiazepine prescriptions for all residents and all time periods \((n=795)\), the winsorized average (mean) length of time was 60.46 weeks (1.16 years), with a median length of time of 40 weeks (0.77 years). For all the residents receiving neuroleptics (1002), the average number of neuroleptic prescriptions (1459) per person was 1.46. For all the residents receiving benzodiazepines (800), the average number of benzodiazepine prescriptions (1004) per person was 1.26.

DIFFERENCES IN PSYCHOTROPIC DRUG USE BETWEEN URBAN AND RURAL LTC FACILITIES
Significant differences existed in the use of psychotropics between urban versus rural LTC facilities. While an average of 26.1% (456.83 out of 1749.83) of residents in urban facilities for all time periods received a neuroleptic drug, an average of only 15.7% (108.17 out of 687.67) of residents in rural facilities did so: \(\chi^2(1, n=2427) = 28.46, p = 0.000\). Similarly, an average of 18.0% (315.33 out of 1749.83) of residents in urban facilities received a benzodiazepine drug, while only an average of 8.6% (59.17 out of 678.67) of residents in rural facilities did so: \(\chi^2(1, n=2429) = 32.56, p = 0.000\).

There were also significant differences between urban and rural LTC facilities in their prn use of neuroleptics: 30.0% (362 out of 1206) of urban neuroleptic prescriptions being written and administered prn, compared with only 15.0% (83 out of 253) rural neuroleptic prescriptions: \(\chi^2(1, n=757) = 7.71, p = 0.005\). No such significant difference \((\chi^2(1, n=535) = 1.78, p = 0.18)\) was seen between the average percentage of residents in urban sites on benzodiazepines (63.9%, 278.17 out of 435.5) and rural residents (56.3%, 55.5 out of 98.5). No other significant differences were found between urban and rural LTC facilities regarding neuroleptic or benzodiazepine use.

USE OF PSYCHOTROPIC DRUGS COMPARED TO SELECTED U.S.A. LEGISLATION (OBRA)
Certain data allowed comparison between the results of this study and standards established by existing U.S.A. legislation (OBRA, 1987), such as the documentation of appropriate reasons for administration of psychotropics, and efforts to implement dose reductions and/or psychotropic drug holidays
within 6 months of a psychotropic prescription starting. As discussed earlier, only 33.5% (488 out of 1455) of neuroleptic prescriptions and 39.4% (394 out of 999) of benzodiazepine prescriptions had accompanying documented reasons for the prescription. By contrast, OBRA regulations would require that all prescriptions for major or minor tranquilizers have reasons documented for their use. Furthermore, examination of the reasons that were documented for neuroleptics revealed that only 30.5% of the documented reasons given (148 out of 484) would be considered appropriate under OBRA legislation.

Only 7.0% (102 out of 1458) of neuroleptic prescriptions were stopped or showed an attempt made for dose reductions during the year of data collection. The percentage for benzodiazepines prescriptions exhibiting stoppage or dose reductions was even lower, at 2.0% (20 out of 994).

EFFECT OF EDUCATION INTERVENTION ON PSYCHOTROPIC DRUG USE

The primary hypothesis, that the intervention facilities would show less post-intervention use of psychotropics than the control facilities, was not supported. Rather, as indicated in Figure 2, both control and experimental LTC facilities experienced a small rise in the percentage of residents receiving neuroleptics after the education intervention between Time 3 and Time 4, although the increases were only significant in the control group. McNemar tests on the control facilities data revealed statistically significant increases in neuroleptic use 2 months post-intervention (Times 3 and 4, $p = 0.000$), 4 months post-intervention (Times 3 and 5, $p = 0.000$) and 6 months post-intervention (Times 3 and 6, $p = 0.000$). McNemar tests on the experimental facilities data did not find any statistically significant increases in neuroleptic use 2 months post-intervention (Times 3 and 4, $p = 0.130$), 4 months post-intervention (Times 3 and 5, $p = 0.191$) or 6 months post-intervention (Times 3 and 6, $p = 0.112$).

For benzodiazepine use (Figure 2), McNemar tests on the control facilities data also revealed smaller but statistically significant increases in benzodiazepine use 2 months post-intervention (Times 3 and 4, $p = 0.008$), 4 months post-intervention (Times 3 and 5, $p = 0.010$) and 6 months post-intervention (Times 3 and 6, $p = 0.008$). McNemar tests on the experimental facilities data did not find any statistically significant increases in benzodiazepine use 2 months post-intervention (Times 3 and 4, $p = 0.442$), 4 months post-intervention (Times 3 and 5, $p = 0.516$) or 6 months post-intervention (Times 3 and 6, $p = 0.611$).

Increases in the total doses of neuroleptics administered after the education intervention were seen in both control and experimental facilities, although the effect was more pronounced in the control facilities (Figure 3). R-ANOVA conducted on the average doses of neuroleptics administered in control and
Average Total Dose of Neuroleptics Administered in Control Vs. Experimental Facilities during T1-T6 (average N of neuroleptics t1-t6 = 1012.17)

Average Total Dose of Benzodiazepines Administered in Control Vs. Experimental Facilities during T1-T6 (Average N of Benzodiazepines for t1-t6 = 990.83)

Fig. 3. Average mg total doses of neuroleptics (CPZ equivalent) and benzodiazepines (DZP equivalent) administered in intervention and control facilities: Time 1 to Time 6.

experimental facilities at 2 months post-intervention (Time 3 vs. Time 4) revealed significant effects for both time ($F (1.813) = 17.69$, $p = 0.000$) and time by facility ($F (1.813) = 7.09$, $p = 0.008$). R-ANOVA conducted for 4 months post-intervention (Time 3 vs. Time 5) also revealed significant effects for both time ($F (1.813) = 25.50$, $p = 0.000$) and time by facility ($F (1.754) = 5.58$, $p = 0.008$).
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$p = 0.018$). R-ANOVA conducted for 6 months post-intervention (Time 3 versus Time 6) revealed significant effects for time \( (F(1.712) = 23.38, p = 0.000) \) but not for time by facility \( (F(1.712) = 2.24, p = 0.140) \).

The total doses of benzodiazepines remained largely unchanged over time in control and experimental facilities (Figure 3), although the control group experienced two decreases post-intervention at Times 4 and 6. R-ANOVA conducted on the average benzodiazepine doses administered in control and experimental facilities at 2 months post-intervention (Time 3 vs. Time 4) revealed significant effects for time by facility \( (F(1.793) = 6.11, p = 0.014) \) but not for time alone \( (F(1.793) = 0.25, p = 0.62) \). R-ANOVA conducted for 4 months post-intervention (Time 3 vs. Time 5) found no significant effects for either time \( (F(1.734) = 2.08, p = 0.15) \) or time by facility \( (F(1.734) = 3.00, p = 0.083) \). R-ANOVA conducted for 6 months post-intervention (Time 3 vs. Time 6) revealed significant effects for time by facility \( (F(1.699) = 4.77, p = 0.029) \) but not for time alone \( (F(1.699) = 0.18, p = 0.67) \).

**Discussion**

**Use of neuroleptic drugs**

One in three (32.7%) residents received a psychotropic drug during the course of the study, indicating substantial use of these drugs. Our finding that 23.2% of all residents received neuroleptics is similar to that of the recent Canadian study by Bronskill et al. (2004), lower than the values found by Conn et al. (1999) and Hagen et al. (2005), and higher than the rate of 17% found in the Canadian study by Earthy et al. (2000). If compared internationally, the use of neuroleptics in our Canadian study is higher, on average, than in the majority of industrialized countries (Hughes et al., 2000; Llorente et al., 1998; Ruth et al., 2001; Sorenson et al., 2001), with the possible exception of Australia (Snowden and Roy-Byrne, 1998).

There are three main reasons of concern regarding the comparatively high rate of neuroleptic drug use found in this study. The first is the well-documented increased risk of adverse effects that these drugs pose for the elderly patient. These adverse effects include a significantly increased risk for tardive dyskinesia (Jeste et al., 1999a; 1999b; 1999c; Woerner et al., 1998), drug-induced parkinsonism (Avorn et al., 1995; Caligiuri et al., 1998), falls and/or hip fractures (Leipzig et al., 1999; Ray et al., 1987) and worsening cognitive decline (McShane et al., 1997).

According to some (Jeste et al., 1999a; 1999b; 1999c; Martin et al., 2003), there is a belief that most adverse effects of neuroleptics can be avoided by using atypical neuroleptics. Our present study reflects this belief, with 79.6% of all neuroleptic prescriptions being for atypicals, notably risperidone. However, a
substantial body of long-term evidence on the safety of these drugs does not exist, and the use of atypicals in elderly patients can be associated with adverse extrapyramidal or cognitive effects (Frenchman and Prince, 1997; Lavretsky and Sultzter, 1998). In addition, Lee et al. (2004), in their systematic review of atypicals in treating behavioral and psychological symptoms of dementia (BPSD) in persons with dementia highlight the fact that adverse events – including extrapyramidal symptoms, somnolence and abnormal gait – are common, and that “limited evidence supports the perception of improved efficacy and adverse-event profiles compared with typical antipsychotic drugs” (p. 1). Furthermore, there is emerging evidence of an association of these newer agents with diabetes (MELKerson and Dahl, 2004) and so-called cerebrovascular adverse events (Health Canada Important Drug Safety Information, 2002; 2004). Thus, complacency regarding the safety of these drugs for BPSD is not defensible at this time.

The second reason for the concern over the comparatively high use of neuroleptics found in this study is the low efficacy of these drugs. Two meta-analyses of controlled trials of neuroleptic treatment in dementia (Lanctot et al., 1998; Schneider et al., 1990) have demonstrated that the efficacy of neuroleptics is low, and that the efficacy rate is roughly equivalent to the side-effect rate. Notably, the high placebo response found in the majority of these studies is curious, in that the placebo effect occurs not in the nursing home resident with dementia (who is unable to rate him or herself) but in the nursing staff, who generally rate the resident in such studies. Given the low efficacy of neuroleptics when used with LTC residents with dementia, it is not surprising that several studies have also found that the majority of residents can be withdrawn from neuroleptics without increases in difficult behavior (Bridges-Parlet et al., 1997; Cohen-Mansfield et al., 1999; Risse et al., 1988).

The final reason to be concerned about the relatively high use of neuroleptics in this study population is the cost of these drugs to nursing homes, particularly the newer atypical neuroleptics. While some recent papers have suggested possible cost-effectiveness associated with the use of atypicals (Kleinman et al., 2004), their cost can be from four to eight times higher than traditional neuroleptics such as haloperidol (Goode, 2003). Dewa and Goering (2001) have reported a 33% increase in expenditure on antipsychotics in Ontario between 1992 and 1998, and many nursing home administrators in our study voiced significant concerns over the increasing proportion of their budget spent on atypical antipsychotics. As many of these administrators pointed out, such increasing expenditures make it difficult to pay for adequate nursing staffing, a factor that at least one study has suggested decreases the need for tranquilizers (Svarstad and Mount, 1991).
Use of benzodiazepines

The use of benzodiazepines in this study, at 15.4% of residents, is considerably lower than that reported in the study by Conn et al. (1999), and in several other studies outside of Canada (Schjott et al., 1999; Svarstad and Mount, 2001). This lower rate of benzodiazepine use among the residents in our study can be seen as a positive finding, particularly given the identified concerns over the use of benzodiazepines with elderly people, such as the increased risk for falls and hip fractures associated with such drugs (Pierfitte et al., 2001; Ray et al., 2000; Wagner et al., 2004). However, the high use of “as required” (prn) prescriptions for benzodiazepines (64.5% of prescriptions) in this study highlights the potential risk of variability in administration due to discretion of nursing staff, and the need for nurses to have a greater understanding of these drugs.

Comparison of study use of psychotropics with existing guidelines

Only a third of psychotropic prescriptions in this study had any evidence of a documented reason (an OBRA requirement), and of the reasons that were given, only 30.5% would have been considered appropriate according to OBRA regulations (which do not apply in Canada). This calls for improved documentation of the reasons given for these drugs, and vigilance that they are given only for appropriate reasons.

The average length of time for neuroleptic and benzodiazepine prescriptions was 1.02 and 1.16 years, respectively, and only 7.0% of neuroleptic prescriptions and 2.0% of benzodiazepine prescriptions showed any evidence of attempts to either reduce the dosage or stop the drug. These results are incompatible with OBRA regulations, which state that attempts to stop or reduce dosages of psychotropic drugs should be made at least every 6 months. Once again, more prudence is needed to reduce the length of time that nursing home residents receive these drugs.

Rural versus urban use of psychotropics

This study found that residents in rural LTC facilities received psychotropics at approximately half the rate of their counterparts in urban LTC facilities, but we do not know the reason for this. The clinicians and nursing home administrators we questioned about this finding indicated that they thought that the smaller size of the rural LTC facilities (46.29 beds) compared to the urban LTC facilities (166.60 beds) made for less busy and less noisy facilities, with smaller more integrated care teams, which in turn may have had a calming influence on residents.
Effect of education intervention on psychotropic drug use

Our finding that the intervention did not reduce the percentage of residents on neuroleptics or benzodiazepines or the dosages administered, is inconsistent with the findings of Avorn et al. (1992), who reported that provider education reduced the use of psychotropic drugs in nursing homes. The study of Avorn et al., however, was conducted in the context of existing OBRA regulations, and the results of our research in a non-regulatory environment mirror more the findings of both a Canadian study (Pimlott et al., 2003) and two Australian studies (Yeo et al., 1994; Zwar et al., 2000) that found that educational outreach for physicians had no effect on benzodiazepine prescribing. If anything, our study detected an increase – at least in the use of neuroleptic drugs – after the education intervention in both control and experimental groups. We found it difficult to explain such an increase, although it is conceivable that this was a delayed response to the addition of risperidone to the urban LTC facilities formulary in late 2000, combined with industry-sponsored promotion of the use of atypicals (especially risperidone) in LTC. It is also conceivable that the increase merely reflects the normal and wide variation in psychotropic drug use in LTC over time noted in other studies.

Implications

The findings of this study raise a number of important implications:

(1) Overall, the finding that approximately a third of residents were receiving a psychotropic drug reflects a substantial use of these drugs, particularly neuroleptics. This substantial use, combined with the considerable time that nursing-home residents were taking these drugs, the lack of good documentation on appropriate reasons for their use, and the overall high risk of adverse effects and low efficacy in this population, suggests a need to improve the monitoring and use of these drugs by physicians and nursing staff in LTC facilities.

(2) The finding that an extensive and resource-intensive educational outreach program targeting physicians, nursing staff, pharmacists and family members had no impact on reducing the use of these drugs suggests that voluntary educational efforts alone may be ineffective agents of change. It is highly unlikely, therefore, that voluntary guidelines on the use of the drugs, if implemented, will necessarily be followed, and a strong case could be made for the implementation of mandatory regulations in Canada on the use of psychotropics in nursing homes, similar to the OBRA regulations seen in the U.S.A. This may require a concomitant examination of the current levels of staffing in Canadian LTC facilities, and the role that staffing levels may play in psychotropic drug use.
(3) More research on effective ways to monitor and reduce the use of psychotropics in Canadian LTC facilities would be very beneficial. In particular, more in-depth studies of the unique characteristics and culture of “model” LTC facilities that demonstrate lower use of psychotropics – such as the rural facilities in this study – would help to ensure appropriate use of psychotropics in all LTC facilities.

Limitations
(1) Inability to conduct a randomized trial of provider education, due to the possibility of physician contamination.
(2) Although there were no statistically significant differences in characteristics between intervention and control facilities, the possibility remains that there was some important difference between the two groups of facilities that the researchers did not measure.
(3) Although the majority of resident characteristics did not differ significantly between the two groups of facilities, there were small but statistically significant differences in the percentage of residents with diagnoses of dementia and Parkinson’s disease that may have influenced the study findings.
(4) The difficulty in recruiting urban physicians into the education intervention was a limitation, and better physician attendance may have strengthened the intervention.

Conflict of interest declaration
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Description of authors’ roles
Brad Hagen is the primary author of the grant application and the manuscript, and contributed significantly to the study concept and design, the data analysis and the training and supervision of the research project manager and personnel. Chris Armstrong-Esher and Paddy Quail, the grant co-applicant, also contributed to the design, grant application, manuscript and data analysis; in addition the latter was responsible for liaison with primary physicians. Robert J. Williams, primary statistical consultant, worked on data analysis and the manuscript, as did Peter Norton, who also assisted with the study proposal.
and design. Carole-Lynne Le Navenec helped prepare the educational material, and contributed to the manuscript and the management of the project, in which Roland Ikuta was also involved, in addition to physician liaison. Project management, together with development of the educational material, was further shared by Roxanne Zieb, Maureen Osis, who also delivered the family education program, and Val Congdon, who liaised with physicians. These three, together with Paddy Quail, Carole-Lynne Le Navenec, and Roland Ikuta were members of the steering committee, of which Brad Hagen was the chairman.

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