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Antipsychotic Medications and Disruptive Behavior in Long-Term Care: "A Path Analysis"

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Abstract

The purpose of this study was to examine the frequencies and structure of score on Minimum Data Set 2.0 (MDS 2.0) items relevant to disruptive behaviour and antipsychotic medications in Ontario LTC home residents. These items consisted of delirium, restraint use, activities of daily living (ADLs), depression, cognitive impairment and bladder incontinence. Lisrel Path analysis was used for the analysis. Significant positive effects were found between delirium and disruptive behaviour, cognitive impairment and delirium, disruptive behaviour and antipsychotic medication, depression and disruptive behaviour, depression and delirium, restraint use and delirium, cognitive impairment and antipsychotic medication, ADLs and antipsychotic medication, ADLs and restraint use, cognitive impairment and restraint use. Significant negative effects were found between antipsychotic medication and disruptive behaviour, ADLs and antipsychotic medication, and disruptive behaviour and delirium.

Literature Review

The Behavioural and Psychological Symptoms of Dementia (BPSD) include behavioural symptoms, psychotic symptoms, mood symptoms and other symptoms such as diurnal rhythm disturbance that can affect elderly patients with dementia. These behaviours are very frequent and occur in as many as 90% of patients with dementia. Causes are not well understood although biochemical, neuroanatomical, and personality traits have been associated with BPSD. Some researchers found a link between delirium, depression, bladder incontinence and disturbing behaviour in long-term care facilities for the elderly. It is important to pinpoint these conditions and deal with them appropriately.

For the most part, these disruptive behavioural symptoms are managed with psychotropic medications. Their use is controversial, however, because many controlled studies continue to raise questions as to their effectiveness and their side effects are numerous and dangerous. Between 2002 and 2004, Health Canada, the FDA, and the U.K. Committee of Safety of Medicine issued advice and warnings to physician regarding the increased risk of death and increased risk of cerebrovascular events in elderly patients with dementia treated with antipsychotics. All prescribing information now indicates that antipsychotic medications are not recommended for elderly patients with dementia.

Despite these warnings, however, antipsychotic drugs continue to be prescribed at an alarming rate, especially for those elderly confined to long-term care facilities.

Although this review of the literature mainly pertains to the behavioral and psychological symptoms of dementia (BPSD), these symptoms are not exclusively seen in patients diagnosed with dementia.

Types of Dementia

Dementia includes a loss of brain function. It is not a single disease but encompasses a group of illnesses that involve memory, behaviour, learning and communication problems. These problems are progressive. Alzheimer's disease (AD) is the most common cause of dementia. (Burns & DeDeyn, 2006). It is characterized by dense accumulation of neurofibrillary tangles and amyloid plaques in the medial temporal lobe and leads to neuronal loss that is visible as atrophy on MRIs. A 6-year longitudinal cohort study found that atrophy of the hippocampus and amygdala also predicted dementia in cognitively intact elderly people (Heijer et al., 2006). The other major cause of nonreversible dementia is vascular dementia which is caused by a series of small strokes. These two conditions often co-occur.

Another type of dementia is called Dementia with Lewy Bodies (DLB). DLB is linked to abnormal protein structures in the brain. It is associated with AD but it is not known if DLB is a subtype of AD or a separate disease. Also associated with dementia-like symptoms are damaged blood vessels or nerve structures, and conditions such as Parkinson's disease, progressive supranuclear palsy (Steele-Richardson-Olszewski syndrome), Creutzfeldt-Jakob disease, cerebrovascular disease, central nervous system infection, brain trauma or tumours, vitamin deficiencies, anoxia, metabolic conditions, endocrine conditions, immune disorders, Prion disease, Wernicke-Korsakoff syndrome, normal-pressure Hydrocephalus, Huntington's chorea, AIDS and multiple sclerosis.

Diagnostic features include multiple cognitive deficits that include memory impairment and at least one of these cognitive disturbances: aphasia, apraxia, agnosia, or a disturbance in executive functioning. Persons with dementia have difficulty learning new material, or may forget previously learned material. Both forms of memory impairment are usually seen in people

with dementia. They may have difficulty naming individuals and objects (aphasia). Apraxia may manifest as the inability to comb their hair or wave goodbye. In the later stage they will become unable to recognize family members or even their own reflection in the mirror. Disturbances in executive functioning which involve the ability to think abstractly and to plan, initiate, sequence, monitor, and stop complex behaviour are common. The individual may have difficulty coping with new tasks and may avoid situations that involve the learning of new and complex information. These criteria must be severe enough to cause significant impairment in social and occupational functioning and must represent a decline from a previous level of functioning. Dementia is not diagnosed if these symptoms occur exclusively during the course of a delirium (American Psychiatric Association, 2000).

Behavioural and Psychological Symptoms of Dementia

The BPSD are not newly discovered phenomena. Over a century ago they were described by Alois Alzheimer who in his case description of the illness (Alzheimer's disease) talked about hallucination, paranoia, delusions of sexual infidelity, physical aggression and screaming (Finkel, 2001). The BPSD include behavioural symptoms such as agitation, wandering, disinhibited behaviour, psychotic symptoms such as delusions and hallucinations, mood symptoms such as depression and anxiety and other symptoms such as diurnal rhythm disturbance (Suh, Greenspan & Choi, 2006). The BPSD result in negative labelling, isolation and decrease quality of life for the patients and in injuries, high turnover, withdrawal, absenteeism and burnout in nursing staff and other caregivers. They are often the decisive factor behind a family's decisions to institutionalize a family member (Barton & Yaffe, 2006; Caballero, Hitchhock, Scharre, Beversdorf & Nahata, 2006; Masand, 2004; Pulsford & Duxbury, 2006, Voyer et al. 2005).

Prevalence of Disruptive Behaviour and the BPSD

BPSD are very frequent and occur in as many as 90% of patients with dementia (Colombo et al., 2007). Symptoms will vary depending on the cause of dementia. In vascular dementia greater rates of depression are seen while in Lewy body Dementia visual hallucinations are more prevalent. In fronto-temporal lobe dementia symptoms of apathy and/or aggression are more prevalent. Dementia results in increasing cognitive symptoms that occurs in a linear fashion whereas the BPSD fluctuate in rate and frequency over the course of the disease and different symptoms appear and disappear as the disease progresses. Some side effects from the medications that are used to manage the BPSD also resemble symptoms of BPSD. Preexisting cognitive problems also make it difficult to ascertain which symptom is caused by the disease and which is caused by the drugs (Davidson, 2001; Finkel, 2001).

Specific Behavioural and Psychological Symptoms

Specific behavioural and psychological symptoms include delusions and during the course of the illness 73% of patients with Alzheimer's disease will experience them. The most common delusion is that of "people stealing things." It occurs when the patient misplaces things. It often causes much distress for the patient who believes everyone is stealing things from him. This can cause behavioural disruptions (Finkel, 2001).

Misidentification such as "This is not my home or I want to go home" also frequently occurs. This belief will prompt them to pack their belongings and as they try to "get back home" might contribute to wandering. *Hyperindentification* (where they believe that people are dressing up as others) also sometimes happens.

Wandering can be very dangerous especially during the winter months. It includes aimless walking and again, attempts at leaving home. It is one of the most common behavioural symptoms and prevalence can be as high as 53% (Finkel, 2001).

Visual hallucinations One common hallucination is "Look at the children in the room". Hallucinations often co-occur with visual abnormalities and agnosia.

Different studies have shown *Depression* to affect 10 to 50% of patients with Alzheimer's disease (Finkel, 2001). Tearfulness, self-deprecating comments and anhedonia are some of the symptoms that manifest.

Anxieties such as worries about finances, health, the future, daily events, activities, being alone, crowds, darkness and bathing may also occur.

Agitation such as inappropriate verbal, vocal or motor activity is also a common symptom and can indicate discomfort such as pain or be a side effect, such as akathisia, of antipsychotic medications. Agitation has been shown to be a risk factor for falls (Finkel, 2001). There is a difference between agitation and akathisia however. Agitation as a symptom of the BPSD is periodic or intermittent and reduced when the patient becomes engaged in an activity while akathisia which is a side effect of antipsychotic medications is continuous and persists even when the patient is occupied (Lesser & Hughes, 2006).

Rage such as sudden emotional or physical outbursts also happens (Finkel, 2001).

In addition to the above symptoms Stones, Stewart and Kirkpatrick, (2003) found an overall prevalence rate of 14% for verbally disruptive behaviour, 3% for physically disruptive behaviour and 12% for both verbally and physically disruptive behaviour for the elderly with dementia in an Ontario long-term care facility.

Causes and Predictors of BPSD

Causes of BPSD are not well understood although biochemical, neuroanatomical and personality traits have been associated with BPSD. Physiological dysfunction such as deficits in dopamine activity has been found in psychosis not only in schizophrenia but in Alzheimer's disease. A comparison done between aggressive AD patients and nonaggressive AD patients also found that aggressive patients had a higher serotonin deficit. (Mintzer, 2001).

Other studies point to the environment or caregiver responses. (Finkel 2001; Pulsford & Duxbury, 2006.) Earlier research stressed the importance of cognitive triggers for disruptive behaviour, recently however there has been an emphasis on the importance of noncognitive factors (Horowitz, 1997).

Causes of Disruptive Behaviour

Stones et al. (2003) examined disruptive behaviour (verbally and physically disruptive behaviour) in long-term care facilities using the Minimum Data Set (2.0) and found, based on findings from a previous study, that the strongest predictors of disruptive behaviour related to delirium, untreated depression, and bladder incontinence. These findings are important because they relate to issues that can be treated or reversed.

Other factors that have been linked to disturbing behaviours include external factors such as noise pollution (bells, loud televisions and radios), lack of consistency, abruptness and tenseness which can all cause anxiety in residents. Limited resources and shortages of staff in nursing homes often lead to unmet needs such as the failure to respond in a timely manner when a resident is feeling tired, depressed, dehydrated, constipated or in pain. This can lead to disruptive behaviour (Olson, 2002). Feelings of loss of control, self-determination and autonomy have also been linked to agitation and aggression in the elderly (Hall & Bocksnick, 1995).

Impact on Caregivers

BPSD and other disturbing behaviours are very prevalent and cause much distress to patients, families and caregivers. The psychological and physical impact of aggressive behaviour on caregivers can be debilitating. Some professional caregivers believe that the acts of violence that are perpetuated against them are random and nonintentional; others are not so sure (Hirst, 2000). Although these BPSD are often dismissed as trivial and part of the job, many professionals don't view it that way. Some view these acts as deliberate and intentional. The attacks perpetuated on the caregivers by these elderly patients may prompt some caregivers to retaliate and this could potentially lead to a vicious cycle of negative responding or elder abuse (Pulsford & Duxbury 2006). Other residents are also affected. Some of the most common injuries to occur between residents who are aggressive towards each other are fractures, dislocations, bruises, lacerations and reddened areas (Shinoda et al., 2004).

Management of Behavioural and Psychological Symptoms

Drug therapy for the elderly should be reserved for situations where nonpharmacological interventions have been fully explored and implemented or when severe and dangerous symptoms are present. Diagnosis should also ensure that sources of delirium are eliminated. These include medication intoxication, withdrawal reactions or drug interactions, dehydration and infection. An expert panel warned that other conditions need to be ruled out before prescribing antipsychotics as these might lead to disruptive behaviour (Alexopoulos, Streim, Carpenter & Docherty, 2004). Among those other conditions we find: delirium, agitated depression, pain (e.g., from osteoarthritis), dysuria (e.g., from infections), abdominal discomfort (due to constipation) and pruritis (severe itching). For the most part, the BPSD are managed with psychotropic medications (Alexopoulos et al., 2004).

Psychotropic drug use with demented elderly patients is controversial because many controlled studies continue to raise questions as to their effectiveness and their side effects are numerous and dangerous. One meta-analysis found that the quality of the trials varied. Efficacy was found for two drugs aripiprazole and risperidone and not for olanzapine. Response rates were frequently not reported. Smaller effects were seen in patients with less severe dementia, outpatients and patients with psychosis. One third dropped out without any difference between drug and placebo. Cognitive test scores were also found to worsen with drugs. Small statistical effect of -.016 SD units were found overall and ranged between -0.11 and -.022 (Ballard et al., 2000; Schneider, Dagerman & Insel, 2006). Psychotropic medications used to treat the BPSD include antidepressants, antipsychotics and antianxiety medications. This review will focus on the use of antipsychotics in the management of the BPSD.

Antipsychotic Medications to Control the BPSD

Although nonpharmacological treatments (such as bright light therapy, exercise programs, music exposure, aromatherapy, pet therapy or one of several behavioural treatments) should be tried first, antipsychotic medications (which are not recommended in elderly patients with dementia) continue to be prescribed as an attempt to control these disruptive behaviours (CPS, 2007). These drugs consist of the atypical antipsychotics or second generation antipsychotics (risperidone, olanzapine, quetiapine, aripiprazole and ziprasidone) and the typical antipsychotics or first generation antipsychotics (haloperidol, loxapine, etc).

A Canadian large scale retrospective study which analysed data between 1997 and 2003 found that 75.2% of new users in the community started on risperidone, 19.6% on olanzapine and, 5.2% on quetiapine. As for the typical antipsychotics 60.2% started on haloperidol, 17.9% on loxapine, 10.3% on thioridazine, chlorpromazine 5.8% and perphenazine 3.5%. They found a

similar breakdown use in the LTC cohort (Gill et al., 2007). Another 1-year Canadian study found that the most commonly prescribed antipsychotic medications in LTC facilities were risperidone (42.4%), loxapine (28%), olanzapine (20.4%) and quetiapine (10.6%), (Hagen et al., 2005).

The use of antipsychotics has helped some elderly patients but not all have benefited from using them. Reviews of placebo controlled trials reveal a high placebo response rate as well as modest drug effect (Streim, 2003). Controlling the BPSD with antipsychotic drugs remains very controversial especially when long-term use is concerned. Their effectiveness also comes from short term placebo-controlled studies that use strict inclusion and exclusion criteria, and consequently these results may not necessarily generalize to the clinical populations (Masand, 2004). The Compendium of Pharmaceuticals Specialties 2007 (CPS), states that antipsychotics are contraindicated for the management of disruptive behaviour in dementia except for risperdal. Indications and clinical use affirm that "Risperdal may be useful in severe dementia, but only for the short-term symptomatic management of inappropriate behaviour due to aggression and/or psychosis" (p.2093). Although serious contraindications have been issued by drug manufacturers as a result of controlled studies, such as increased risk of death, they are still being prescribed at an alarming rate. The CPS (2007) Serious Warnings and Precautions states:

> Increased mortality in elderly patients with dementia: Elderly patients with dementia treated with atypical antipsychotic drugs are at an increased risk of death compared to placebo. Analyses of thirteen placebo controlled trials with various atypical antipsychotics (modal duration of 10 weeks) in these patients showed a mean 1.6 fold increase in death rate in the drug-related patients. Although the causes of death were varied, most of the deaths appeared to be either cardiovascular (e.g., heart failure, sudden

death) or infectious (e.g., pneumonia) in nature (See warnings and precautions, special populations, Use in geriatric patients with Dementia). (p.2093).

Because side effects are often worse in the elderly they pose risks that may outweigh the benefits.

In Canada, there is no law regarding the prescription of antipsychotic medications in LTC facilities. In the United States, however, a federal law was passed in 1987 (OBRA '87) in response to the accumulating evidence regarding the inappropriate use of antipsychotic medications for the treatment of disruptive behaviour in elderly dementia patients. This law was intended to protect residents of nursing homes and assisted-living facilities who received government funding against the inappropriate use of these medications. According to this law, antipsychotics can only be prescribed for agitation, aggression and psychotic behaviour that is distressing to the patients or dangerous to others including the staff (Harvard Mental Health Letter, 2007). This law was enacted to prevent elderly patients with dementia from being drugged into a stupor.

Therapeutic Profile

The therapeutic profile of antipsychotic medications is only beginning to be studied extensively in the elderly. To date, the available data do not allow any definitive conclusions as to which symptoms are most responsive to antipsychotic drugs or how the effects vary according to the severity of the symptoms (Frazer, Herr, Katz & Portney, 2001). In the Risperdal information section of the CPS (2007) it is recommended that it be used for aggression and psychosis only as other behavioural disturbances remain unaffected.

A Canadian Study of 2,332 residents undertaken in 28 LTC home in Quebec in 1996 concluded that antipsychotic medications were being prescribed for all types of disruptive

behavioural profiles regardless of the lack of evidence as to their effectiveness. Increases in incidences of disruptive behaviour increased the risk of being administrated an antipsychotic (Voyer et al., 2005). A 1-year longitudinal study found seven behaviours associated with antipsychotic use in the elderly: wandering, pacing, exhibiting objectionable behaviour, making intolerable noises, interfering with staff, refusing staff instructions and hitting, biting and scratching (Burton, Rovner, German, Brant & Clark, 1995).

A Danish study reported that staff assessment independently determined the use of psychotropic medications including antipsychotics regardless of the presence of a psychiatric diagnosis. Of those elderly receiving an antipsychotic, 24% had a (Geriatric Mental Scale) GMS-AGECAT diagnosis. Behaviours associated with the use of antipsychotics included "becoming upset, fidgeting, being restless, screaming and yelling loudly" (Sorensen, Foldspang, Gulmann & Munk-Jorgensen, 2001, p. 148).

In one study, residents over the age of 75 and men were more likely to be treated with an antipsychotic than women. Restraint use, poorer mental health status, and having complicated dementia were also associated with its use (Burton et al., 1995). In another study, age was found to affect the type of antipsychotic (typical or atypical) one received. Those younger than 65 years of age were more likely to be prescribed an atypical antipsychotic or to be switched to one compared to claimants older than 65 (Dewa, Remington, Herrman, Fearnley & Goering, 2002).

A cross-sectional survey research of 2017 dementia patients who were either taking antipsychotic drugs or not taking them (recruited from residential care facilities, nursing homes, group dwelling for people with dementia rehabilitation units (short-term), geriatric and psychogeriatric units) were compared. Six of the 11 factors found to be associated with the prescriptions of antipsychotic were being male, younger, with lower ADL and orientation scores,

more mobile, imposed a greater mental workload on staff and living in a group dwelling for people with dementia. The authors concluded that level of threat perceived by staff was related to whether or not one would be prescribed an antipsychotic (Lovheim, Sandmass, Kalin, Larlsson & Gustafson, 2006).

Another study looked the oldest old among LTC residents and found that socially inappropriate and disruptive behaviour were associated with the reception of an antipsychotic drug. Other factors such as being on a concomitant anxiolytic medication, voicing recurring anxious complaints, having recurring physical movements and having unsettled relationships were also related. Those with a sense of initiative and involvement were significantly less likely to be prescribed an antipsychotic. In this study, negative attitude towards others seemed to be related to antipsychotic medications use also (Alanen, Finne-Soveri, Noro, Leinonen, 2006a).

Appropriate Use of Antipsychotics in the Elderly

Recommendations approved by the American Health Care Financing Administration (HCFA) office list some conditions that are appropriate for the use of antipsychotics for the elderly. These include organic mental syndromes associated with psychotic or agitated symptoms that must include some specific behaviour such as biting, kicking or scratching that are substantively documented and that present a danger for the patients themselves, to others or that interfere with the staffs' ability to provide care. Continuous crying out, screaming, yelling, or pacing and psychotic symptoms such as hallucinations, delusions and paranoia that impairs functional capacity have also been deemed appropriate for their use.

Behaviours that occur in isolation such as wandering, restlessness, anxiety, insomnia, and indifference to surroundings, nervousness, unspecified agitation, poor self-care, impaired

memory, depression, unsociability, fidgeting and uncooperativeness does not warrant the use of antipsychotics (Motsinger, Perron, & Lacy, 2003).

A Canadian 1-year comparative descriptive design study of two LTC centres was conducted on 332 residents. Data on antipsychotic drug use were extracted from patient charts and pharmacy records. Overall, 25% of the residents were prescribed an antipsychotic as p.r.n (as needed). Most did not receive any but some received as many as 90 doses per month. Less than a third of the prescriptions had a reason given for their use. The most common reason given (64%) was continuation of previous prescription. The other reasons included "agitated or aggressive behaviour" (29.7%), "delusional" (4.4%), and "yelling or calling out" (2.2 %). In this study, residents had been receiving antipsychotic medication for an average of 45 weeks and 16% showed evidence of an attempt at dose reduction within the first 6 months (Hagen et al., 2005).

Prevalence of Antipsychotic Medication to Treat the BPSD

In a Danish study of nursing home residents 56% were prescribed a psychotropic medication of which 21% received an antipsychotic drug, typical and atypical (Sorenson, Foldspand, Gulmann & Munk-Jorgensen, 2001). A 3-year retrospective and cross-sectional study was conducted on the RAI-MDS (2.0) data originating from 16 hospital-based LTC institutions (55 wards) and 25 residential homes in Finland. Forty-two percent of the elderly residents received one or more antipsychotic medication in 2001. Mean use was reduced to 39% in 2002 and 2003. Of those with dementia 45% received an antipsychotic in 2001, 43% in 2002 and 41% in 2003. Of those with behavioural problems 59% received an antipsychotic in 2001, 57% in 2002 and 55% in 2003 (Alanen, Finne-Soveri, Noro & Leinonen, 2006b). A Canadian 1-year comparative descriptive design study found prevalence rates that ranged from 22% to 37% depending on the facility (Hagen et al., 2005).

Prevalence rates have increased since the introduction of the newer antipsychotic drugs. A Canadian study was conducted to examine overall trends in antipsychotic use in the elderly and the disadvantaged populations of Ontario between 1992 and 1998. During that time period, claimants of the Ontario Drug Benefit program grew by 1% whereas the number of claimants prescribed an antipsychotic drug grew by 25%. At the same time growth in expenditure increased by nearly 250%. At the time of the passing of the Omnibus Budget Reconciliation Act of 1987 (OBRA) prevalence rates of antipsychotic medications in US nursing homes were as high as 40%. (Hagen et al., 2005).

Typical or Conventional Antipsychotics

The typical or first generation antipsychotics have been widely prescribed since the 1950s. These medications block the dopamine (D2) receptor in the mesolimbic system which in turn reduces the positive symptoms of psychosis such as delusions and hallucinations. Drugs such as haloperidol, thioridazine, fluphenazine, loxapine and perphenazine have shown modest efficacy in the management of the BPSD (Ryan, 2003). They have also been linked to more rapid cognitive decline in patients with dementia (Schneider et al., 2005). The D2 blockade in the nigrostriatal pathway also causes extrapyramidal symptoms such as akathisia, acute dystonia, tardive dyskinesia and the drug-induced Parkinsonism. The extrapyramidal symptoms such as tardive dyskinesia are associated with incoordination, feeding problems, disfigurement, social isolation, falls and fractures (Ryan, 2003). The D2 blockade in the tuberoinfundibular pathway increases serum levels of prolactin. This can cause breast tenderness, galactorrhea or erectile dysfunction (Motsinger et al., 2003).

Haloperidol (haldol)

Hoeh et al. (2003) reported that significant improvement was seen in disruptive behaviour in patients with dementia with haloperidol (haldol) at 2-3 mg per day but not at low doses of 0.5 to 0.75 mg per day. Post-hoc analysis of an 18 week randomized double-blind crossover head-to-head trial of haloperidol vs risperidone in 114 nursing home residents found haldol to be significantly inferior to risperidone in terms of efficacy in treating physical sexual advances, pacing and aimless wandering, intentional falling, hoarding things, performing repetitive mannerism and repetitive sentences or questions, complaining and negativism. More side effects were also reported for haldol (Suh & Shahet, 2006).

Side effects of haloperidol. Moderate to severe extrapyramidal side effects (EPS) or neuroleptic-induced movement disorders are problematic and common with Haldol. In one study as much as 20% of the patients reported them (Streim, 2003). EPS can be classified into acute or tardive syndrome. Among the former we find Parkinsonism, dystonia and akathisia.

Parkinsonism side effects resemble the disease itself. These side effects tend to appear a couple of weeks after initiation of treatment. Bradykinesia is an extreme slowness and stiffness of movement in which rigidity predominates. An impaired righting reflex accompanied by excessive salivation and autonomic instability can sometimes be observed.

Akathisia is a side effect that is commonly mistaken for agitation or worsening of the psychosis. It is defined as a movement disorder characterized by a feeling of inner restlessness and a compelling need of being in constant motion and by actions such as rocking while standing or sitting, lifting the feet as if marching on the spot and crossing and uncrossing the legs while sitting. It is often accompanied by feelings of irritability and aggression (Leikin & Lipsky, 2000).

Akathisia also decreases with age appearing in 15% of patients over the age of 65 compared to 90% in younger patients (Fabbrini, Barbanti & Aurilia, 2001). Tardive Dyskinesia (TD) develops from chronic exposure to the typical antipsychotics and is much worse in elderly patients. It can be irreversible. Although considered a mild disorder it can become debilitating in some patients (Fabbrini et al., 2001). The most common form of TD is the bucco-lingual-masticatory syndrome of mouth, jaw, and tongue movements, chewing and lip sucking. Besides aesthetic problems which may add to the social isolation of older people, some have difficulties keeping dentures in their mouth or eating. Sometimes pharyngeal involvement may cause aspiration pneumonia. Diaphragmatic involvement may also worsen due to respiratory dysfunction. Speech may also be severely impaired (Fabbrini et al., 2001). About 60% of elderly patients suffer from this most common form of TD. Those who are treated with haloperidol for the first time will develop tardive dyskinesia at a rate of 25% to 50% per year. Risk factors for tardive dyskinesia are old age, female gender, nonschizophrenic and presence of acute EPS. Intermittent dosing is also associated with higher rates of tardive dyskenisia (Wirshing, 2001). These numerous side effects have caused a shift toward the atypical antipsychotics (Ryan, 2003).

Atypical Antipsychotics

The atypical antipsychotics have significantly replaced the typical antipsychotics because they cause fewer side effects especially those that relate to the movement disorders (Smith & Beier, 2004). They include risperidone, olanzapine, quetiapine and clozapine. Newer antipsychotic drugs have both serotonergic and dopaminergiv activity (Lawlor, 2004). Their action on both systems makes them effective in treating the positive and negative symptoms of psychosis. Alterations in the serotonin system are related to aggression and the atypical antipsychotics affect the serotonin (5-HT) system. Evidence also indicates a clear deficit in

serotonin receptors in Alzheimer's disease (Mintzer, Streim & Ryan, 2003). Practice guidelines from the American Psychiatric Association inform us, however, that these medications have been associated with glucose dysregulation, hyperlipidemia, and weight gain. Increased risk of cerebrovascular events including stroke was also found in clinical trials of risperidone and olanzapine in geriatric patients with dementia-related psychosis (Rabins, 2006). Risperidone and olanzapine are commonly prescribed in dementia patients (Katz et al., 2007).

In 1998, Expert Consensus Guidelines recommended the use of the atypical antipsychotics risperidone and olanzapine or a high-potency conventional antipsychotic such as haloperidol as first-line therapy for the treatment of the BPSD (De Deyn et al., 2004). In 2002, new data prompted Health Canada to advise physicians "to reassess the risks and benefits in their patients with dementia and to counsel caregivers to immediately report signs and symptoms of cerebrovascular adverse events" (De Deyn et al., p. 117).

Following the Canadian advisory, the U.S. Food and Drug Administration (FDA) mandated that additional warnings regarding the increased risk of cerebrovascular events be added to all prescribing information (Schneider et al., 2005). In March 2004, the UK committee of safety of Medicines (CSM) went a little further in their recommendations and informed clinicians that risperidone and olanzapine should not be used to treat the BPSD because of the increased risk of stroke with both drugs and the increased risk of mortality with olanzapine. The CSM additionally provided these guidelines: Use of risperidone in the treatment of acute psychosis should be limited to short term use under specialist advice. Preexisting risks of cerebrovascular event or disease such as previous history of stroke or transient ischaemic attack (TIA), hypertension, diabetes, atrial fibrillation and current smoking should be evaluated prior to initiating drug treatment in all patients. The CSM also provided a list of Web sites with

information on nonpharmacological interventions. The advice was supplemented by guidance issued by the Royal College of Psychiatrists, Royal College of General Practitioners, British Geriatric Society and Alzheimer's disease Society (Shah, 2006).

Scales Used to Assess BPSD

In order to conduct clinically objective assessments of the BPSD in controlled drug trials three different scales are usually used. These are the Behavioural Pathology in Alzheimer's disease Rating Scale (BEHAVE-AD), the Cohen-Mansfield Agitation Inventory (CMAI), and the Neuropsychiatric Inventory (NPI). These scales have been shown to be sensitive, valid, and reliable measures.

The *BEHAVE-AD* is a simple scale that includes 2 parts -symptomatology and global rating. Symptomatology assesses 25 symptoms in seven categories: delusions, hallucinations, aggressiveness, activity disturbances, affective disturbances and anxiety. In the delusional cluster, for example different symptoms are examined such as: people are stealing things, one's house is not one's home, spouse (or other caregiver) is an imposter, delusion of abandonment, delusion of infidelity, suspiciousness/paranoia. Caregivers are asked to rate the patient's behaviour on a 4-point scale over the preceding 2 weeks. For example for "one's house is not one's home" the scoring would be 0 = *not present*; 1 = *conviction that the place in which one is residing is not one's home*; 2 = *attempt to leave domicile to go home*; 3 = *violence in response to attempts to forcibly restrict exit*. The total maximum score is 75. The global assessment part of the scale is also completed by the caregiver and it assesses the severity of the BPSD: 0 = *not at all troubling*; 1 = *mildly troubling to the caregiver or dangerous to the patient*; 2 = *moderately troubling to the caregiver or dangerous to the patient*; 3 = *severely troubling or intolerable to the caregiver or dangerous to the patient.*

The CMAI is another scale that is frequently used to assess the BPSD. This 7-point rating scale assesses the frequency of 29 agitated behaviours. These are pacing, aimless wandering, inappropriate dress or disrobing, spitting (including at meals), cursing or verbal aggression, constant unwarranted requests for attention or help, repetitive sentences or questions, hitting (including self), kicking, grabbing onto people, pushing, throwing things, strange noises (weird laughter or crying), screaming, biting, scratching, trying to get into a different place (e.g., out of the room, building), intentional falling, complaining, negativism, eating/drinking inappropriate substances, hurt self or other (cigarette, hot water, etc,), handling things inappropriately, hiding things, hoarding things, tearing things or destroying property, performing repeated mannerisms, making verbal sexual advances, making physical sexual advances and general restlessness. Caregivers must be properly trained to complete the scale. Each item is scored with reference to the past 2 weeks and is rated as 1 = *never*, 2 = *1 time per week*, 3 = *1-2 times per week*, 4 = *several times per week*, 5 = *once or twice per day*, 6 = *several times per day*, 7 = *several times per hour.* The total maximum score is 203.

The NPI assesses 12 behavioural symptoms of dementia. The behaviour include delusions, hallucinations, agitation, dysphoria, anxiety, apathy, irritability, euphoria, disinhibition, aberrant motor behaviour, night-time behaviour disturbances as well as appetite abnormalities. Caregivers rate severity on a scale of 1, 2 or 3 (mild, moderate, severe) and frequency 1 to 4. 1 = *occasionally, less than once per week* and 4 = *very frequently, once or more per day or continuously.* The total maximum score for each domain is 12. Caregivers also assess their own level of distress (De Deyn & Wirshing, 2001).

Antipsychotics and the Increased Risk of Death

A retrospective study of 22,890 patients 65 years of age or older who began receiving an antipsychotic between 1994 and 2003 was done to compare risk of death after initiation of an antipsychotic medication whether typical or atypical. It was found that both typical and atypical antipsychotics were associated with risk of death and that the conventional or typical ones had an even greater risk (Wang, Schneeweiss, Avorn & Fisher, 2005).

A Canadian retrospective cohort study was conducted on a total of 27,259 older adults who were followed between April 1997 and March 2003. Information was taken from several databases including pharmacy records from the Ontario drug benefit program, hospitalization records from the Canadian Institute for Health Information Discharge Abstract Database, physician billing information for inpatient and outpatient services from the Ontario Health Insurance Plan, basic demographic information and vital statistics from the Registered Persons Database. Comparisons between new users of atypical antipsychotics vs. no-antipsychotic use and conventional versus vs. atypical antipsychotics were done. Two cohorts were examined: community dwellers and long-term care residents. Statistically significant increase in death was found between atypical users and nonusers 30 days after having started antipsychotics with both cohorts. Typical antipsychotic use was also associated with a higher risk for death at all time points (after 30 days, 60 days, 120 days and 180 days; Gill et al., 2007).

A meta-analysis of 15 randomized placebo-controlled drug trials also found that death occurred more often among patients who received an atypical antipsychotic versus those who did not (Schneider et al., 2005). In April 2005, a public health advisory was issued by the FDA regarding the increased risk of death for dementia patients treated with antipsychotics. Health Canada issued a similar warning in June 2005 (Gill et al., 2007). Antipsychotic drugs however

continue to be prescribed for the management of the BPSD (Layton, Harris, Wilton, Saad & Shakir, 2005).

Risperdal or Risperidone

Risperidone has been extensively researched and is now the most widely prescribed antipsychotic in the elderly (Tune, 2001). It has been around since 1993. The Compendium of Pharmaceuticals Systems (CPS) indicates that Risperdal may be useful in severe dementia for the short-term symptomatic management of inappropriate behaviour due to aggression and psychosis but warns that other behavioural disturbances remain unaffected by risperdal treatment. Evidence coming from short term placebo controlled studies supports the efficacy of risperidone in treating symptoms of aggression, agitation and psychosis. Dosage should be started at 0.25 mg a day and incrementally increased until the desired effect is reached because extrapyramidal symptoms increase as the dose is increased. Mean dosage found in a couple of studies was at 1.2 to 1.2 mg per day (Motsinger et al., 2003).

A 12-week randomized placebo controlled trial of Risperidone conducted for the treatment of aggression, agitation and psychoses in nursing home patients with dementia found greater improvement on all CMAI subscales which measured total aggression such as physical (hitting, wandering.) verbal (screaming, grunting) and agitated behaviour compared to the placebo group at weeks 4 through 12. Positive effects of risperidone was also found for both aggressive and nonaggressive, agitated behaviour. A significant improvement on the BEHAVE-AD (Behavioural Pathology in Alzheimer's disease) was also found in the risperidone group. The more psychotic symptoms were present at baseline the more effective risperidone was relative to placebo. The clinical impression of change assessed by both caregivers and

investigators also found significant improvements in the drug group over placebo. Reduced aggression was found whether patients had a psychosis or not (Brodaty et al., 2003).

Another 12-weeks randomized control trial of risperidone found a reduction in total score of the BEHAVE-AD. A 50% response reduction on the BEHAVE-AD total score was found in 45% of those receiving 1mg/day, 50% of those receiving 2 mg a day and 33% of those receiving a placebo. Significant improvement was seen on the aggression items only. All other subscales differences were not significant. A comparison of violence rates at baseline found a 65% reduction in those who received the drug (regardless of dosage) versus 42% reduction in those who received the placebo. The Cohen-Mansfield Agitation inventory (CMAI) showed significantly greater improvements for those receiving 2 mg and 1 mg per day.

A meta-analysis of 4 large placebo-controlled clinical trials of risperidone in dementia found that it significantly improved scores on the BEHAVE-AD and CGI scale compared to placebo. It was also found that patients who had more severe symptoms responded better to the risperidone treatment than those who had less severe symptoms when compared to the placebo treated group (Katz et al., 2007).

Side effect of risperidone.

Common side effects associated with risperidone include extrapyramidal symptoms, dizziness, hypotension, nausea, weight gain, sleep disturbance, and sexual dysfunction (Katz et al., 2007; Razaq & Samma, 2004). Postural hypotension may predispose to falls and fractures (Ryan, 2003). In one study, rates of extrapyramidal symptoms ranged from 12 (70.4%) in the placebo group to 35 (21.2%) in the 2 mg/day drug group. Somnolence and peripheral edema was also found to increase as the dose was increased. In the placebo group, 13 (8.0%) reported somnolence and 9 (5.5%) reported peripheral edema. In the 2 mg/day group 46 (27.9%) reported

somnolence and 30 (18.2%) reported peripheral edema. They also found that cerebrovascular adverse events and all-cause mortality were observed more frequently in the risperidone treated group compared to placebo although it was not statistically significant (Katz et al., 1999).

In April 2003, Janssen Pharmaceutica Products, L.P., Titusville, New Jersey, the manufacturer of risperidone informed health care providers about a new warning concerning cerebrovascular adverse events (CAE). The warning stated that there was a significantly higher incidence of CAE in patients treated with risperidone compared to those treated with placebo. The warning further stated that Risperdal was not approved for the treatment of patients with dementia-related psychosis. The warning received by Canadian physicians in October 2002 cited the rate of CAE of 4% of the risperidone group versus 2% in the placebo group (Smith & Beier, 2004).

Following the warnings concerning the safety of risperidone and olanzapine in 2004 by the U.K. Committee of Safety of Medicine, a retrospective analysis of three PEM studies (PEM studies are conducted by the Drug Safety Research Unit following a newly marketed drug prescribed in primary care settings in England) was conducted. They examined and compared the incidence rates of cerebrovascular adverse events that were reported within the first 6 months of treatment initiation. Confounding variables such as age, sex, and indication (dementia or other) were also examined. They found that cases of CVA/TIA occurred predominantly in older individuals and that it tended to increase with age but it was unclear if this relationship was linear. They also found that 50% of cases had occurred within the second month of treatment with risperidone. For quetiapine 50% had occurred by the third and fourth month. All three drug cohorts (risperidone, quetiapine and olanzapine) had a significant association with CVA/TIA. The three variables age, sex, and indication were also significantly related. Females prescribed

risperidone had a significantly higher incidence rate of CVA/TIA event compared to males. It was also found that patients prescribed risperidone for dementia were significantly more likely to experience these events compared to those treated with risperidone for other reasons (Layton et al., 2005). The CPS, 2007 also indicates that six 4 to 6 weeks placebo-controlled trials found a 3% incidence rate of CVA in the Risperidone treated group versus 1% in the placebo group. Five patients died in the risperidone group versus 1 patient in the placebo group. A double blind comparison of risperidone and olanzapine for the acute treatment of dementia related behavioural disturbances found 113 adverse events. Adverse events were similar in both groups and the most common were drowsiness, falls and EPS (Fontaine et al., 2003).

Although the CPS, 2007 states that risperdal may be useful in treating aggression and psychosis it also warns about the increased mortality risk in elderly patients with dementia. General considerations warn that a disruption of the body's ability to reduce core body temperature has been attributed to antipsychotic drugs. Vigilance is important when treating patients who may be experiencing dehydration or receiving a concomitant medication with anticholinergic activity.

Carcinogenesis studies of risperidone done on rats show statistically significant increases in pituitary gland adenomas, endocrine pancreas adenomas and mammary gland adenocarcinomas, other side effects listed in the CPS 2007 include orthostatic hypotension, tachycardia, rare cases of syncope, cardiac arrhythmias and first degree AV-block or ECG changes. Because patients with a history of cardiac disorders have been excluded from clinical trials, risperdal should be used with caution in patients with cardiovascular diseases.

According to the CPS 2007, epidemiological studies also suggest an increased risk of treatment-emergent hyperglycemia-related adverse effects. Thus patients treated with

antipsychotics should be monitored for hyperglycemia such as polydipsia (excessive drinking), polyuria (excessive urinating), polyphagia (excessive eating), and weakness. Dysphagia has also been associated with antipsychotics medications. In controlled clinical trials, patients treated with risperidone also had higher prolactin levels than patients treated with haldol. Risperidone may also have an antiemetic effect. This effect could mask signs of toxicity due to overdosage with other drugs, or mask other diseases (CPS, 2007).

Rare cases of priapism (prolonged and painful erections) have also been reported. Neuroleptic Malignant syndrome is a fatal symptom complex that has been reported in patients taking antipsychotic drugs, including risperdal. Clinical manifestations include hyperthermia, muscle rigidity, altered mental status (including catatonic signs) and evidence of autonomic instability such as irregular blood pressure, tachycardia, cardiac arrhythmias, and diaphoresis. Incidences of somnolence are higher in patients treated with risperidone compared to placebo or haldol. Risperdal as with all antipsychotics lowers the seizure threshold and in some patients seizures have occurred (CPS, 2007).

Patients with Parkinson's disease or Dementia with Lewy Bodies should not take risperdal as it increases the risk of Neuroleptic Malignant Syndrome. Symptoms include confusion, obtundation (diminished alertness or consciousness), postural instability with frequent falls and extrapyramidal symptoms. In the recommendations for special populations section, it is recommended that treatment of risperdal be started at low doses because geriatric patients have decreased renal, hepatic and cardiac function and they have an increased risk of postural hypotension. Again the same warning regarding the increased risk of mortality in elderly patients with dementia treated with antipsychotics can be read. Two of four placebo-controlled trials in

elderly patients with dementia found a higher incidence of mortality in patients treated concomitantly with furosemide and risperidone (CPS, 2007).

Olanzapine (Zyprexa)

Evidence indicates that olanzapine is an effective agent against psychotic and behaviour symptoms in patients with Alzheimer's disease (Motsinger et al., 2003). A 6-week placebo controlled trial found that olanzapine was effective in reducing the emergence of psychosis in Alzheimer's disease in patients who had no such psychotic symptoms at baseline compared to the placebo group (Clark, Street, Feldman & Breier, 2001).

A large-scale, double-blind placebo controlled trial in which 652 patients from 61 different sites participated, tested the difference between 5 treatment groups. Doses of 1mg, 2.5 mg, 5mg, 7.5mg and placebo were analyzed. Greater improvements were seen on the psychosis total score for the 7.5 mg group and the magnitude of improvement became greater as the dose increased. The item of the NPI/NH that appeared to be most affected by olanzapine was agitation/aggression. Other items that showed greater improvements were anxiety, apathy/indifference, delusions, euphoria and irritability/lability (De Deyn et al., 2004). According to the CPS however, olanzapine or zyprexa is not indicated in elderly patients with dementia.

Side effects of olanzapine.

Clark et al. (2001) found a significant difference between the olanzapine treated groups who received a dose of 5-mg and 15-mg a day as compared to the placebo group in "Abnormal gait", a term from Coding Symbols for Thesaurus of Adverse Reaction Terms comprising "leaning", "limp", "stooped posture" and "unsteady gait". Another adverse reaction that was significantly different between the treatment and placebo group was somnolence. Somnolence

and sedation causes impairment in carrying out activities of daily living (Ryan, 2003). In De Deyn et al.'s large scale study, pairwise comparisons showed a significantly greater mean increase in body weight for both the 5 mg and 7.5mg compared to the placebo group. Prolactin levels were also different overall with the 7.5 mg group showing a significantly greater increase than the placebo.

In Fontaine et al. (2003), side effects reported were frequent, mild and similar (drowsiness, falls and EPS) to those reported for risperidone but one patient in the olanzapine group had 2 serious adverse events: an episode of asystole (at which time olanzapine was discontinued) followed 6 days later by a brain stem stroke.

Increased risks of diabetes.

In a retrospective study, Koro et al. (2002) assessed the effects of olanzapine and risperidone on the risk of diabetes in patients with schizophrenia. Compared to those not taking antipsychotics those who took olanzapine had a significant increased risk of developing diabetes. No such increase was found in those taking risperidone.

In a retrospective study of 590 patients it was found that patients treated with olanzapine as well as those treated with clozapine and haloperidol were found to have elevated glucose and lipid levels compared to baseline. Those who received olanzapine and clozapine had statistically significant increases in triglyrides levels compared with the other groups. Elevated glucose and triglyceride levels increase the risk for coronary artery disease (Wirshing, Boyd, Meng, Ballon, Marder & Wirshing, 2002).

As with all antipsychotics, the CPS (2007) includes a serious warning of increased mortality rate in elderly patients. Similar side effects that were reported in the CPS for risperidone apply to olanzapine. These are Neuroleptic Malignant Syndrome, weight gain, body

temperature regulation, hypotension and syncope, hyperglycaemia, hyperprolactinemia, antiemetic effect, rare cases of priapism, rare cases of leucopenia (a decrease in white blood cells), transient transaminase elevations (indicators of hepatic injury), tardive dyskinesia, seizures, mild elevation of uric acid (may cause hypertension), overall mortality, dyphagia and cardiovascular events in elderly patients with dementia.

In schizophrenia trials (CPS 2007) adverse events reported included headache, pain, abdominal pain, back pain, chest pain, neck rigidity, intentional injury, postural hypotension, tachycardia, hypotension, constipation, dry mouth, gamma glutamyl transpeptidase increase, increased appetite, ALT increase, edema, peripheral edema, AST increase, creatine phosphokinase increase, arthralgia (joint pain), twitching, somnolence, agitation, insomnia, nervousness, hostility, dizziness, anxiety, personality disorder, akathisia, hypertonia, speech disorder, tremor, amnesia, drug dependence, euphoria, neurosis, rhinitis (runny and congested nose), cough increase, pharyngitis, fungal dermatitis, rash, amblyopia, blepharitis, eye disorder corneal lesion, menstrual disorder and tremor and asthenia.

Quetiapine

Quetiapine or seroquel has shown promises in treating psychosis in elderly patients with Alzheimer's disease and Parkinson's disease without exacerbating movement disorders in those suffering from Parkinsons'. It was introduced to the U.S. market in 1997 (Madhusoodanan, Brenner, Gupta & Bogunovic, 2001). This drug was not only found to be clinically effective but also improved the EPS noted at baseline (Mintzer et al., 2003). Initial dosage should start at 12.5 mg and titrated every 3 to 5 days until the desired effect is reached or side effects start to emerge (Motsinger et al., 2003). Tariot (2004) suggest an initial dosage of 25 mg per day with

incremental increases in dose to target 100 to 150 mg per day. The CPS 2007 however indicates that Seroquel is not indicated in elderly patients with dementia.

Quetiapine's antipsychotic activity is mediated through activity at dopamine (DA2) receptors and serotonin (5-HT2). Pharmacodynamic antagonism is also seen at histaminergic and adrenergic receptors. An open label, multicenter, uncontrolled trial was conducted to assess the long-term tolerability, safety, and clinical benefit of quetiapine in elderly patients with psychotic disorders over the course of 1 year. Overall 89 (48%) patients completed the 52 weeks study. A significant difference between those who completed the study and those who did not was a gradual increase in mean daily dose. These findings suggest using a slow and steady dose increase in elderly patients (Tariot, 2004).

Side effects of Quetiapine.

Common side effects include sedation, headache and orthostatic hypotension. Although a causal relationship between Seroquel and lens changes have not been established, lens changes have been observed in patients during long-term use of Seroquel (CPS 2007). Screening for cataract formation and a general eye exam should also be done at initiation of treatment and at 6 months intervals (Motsinger et al., 2003). In Tariot's (2004) 1-year uncontrolled exploratory study side effects that occurred in more than 10% of the patients were somnolence (31%), accidental injury (24%), dizziness (17%), agitation (16%), postural hypotension (15%), constipation (13%), urinary tract infection (11%), insomnia (10%) and abnormal electrocardiogram (10%). Two patients withdrew from the study due to somnolence, 2 due to dizziness, 1 due to postural hypotension and another because of tachycardia (rapid heart rate). Weight gain was also reported by 4 patients and weight loss by 11 patients. According to the CPS, 2007 all of the side effects previously mentioned with risperidone and olanzapine apply to

quetiapine. A serious warning of increased mortality rate in elderly patients with dementia is again mentioned in the CPS, 2007.

Clozapine (Clozaril)

A randomized, double-blind placebo controlled trial was conducted to assess the efficacy of low dose clozapine to treat psychosis in patients' with Parkinson's disease in 60 patients at six different sites over a 14 month period. Significant improvements were found on the Clinical Global Impression Scale, the Brief Psychiatric Rating Scale and on the Scale for the Assessment of Positive Symptoms. It was also found to improve tremor and it did not worsen Parkinsonism symptoms (Friedman, Lannon, Comella & Factor, 1999). The American Academy of Neurology stated that clozapine was the most effective treatment of drug induced psychosis in patients with Parkinson's disease (Motsinger et al., 2003). Clozapine produces little or no prolactin elevation (CPS, 2007). Clozaril is indicated in the management of symptoms of treatment resistant schizophrenia, it was found to improve both positive and negative symptoms.

Side effects of Clozapine.

Adverse effects are agranulocytosis (an acute disease marked by a deficit or absolute lack of granulocytic white blood cells), seizures, age-related delirium, cardiac effects, sedation and anticholinergic effects (Tariot, 2000). Agranulocytosis has a fatality rate as high as 30% thus Clozaril is only available through a distribution system CSAN that ensures weekly or bi-monthly haematological testing. This testing is required before prescribing another periods supply. Because of the high fatality risk this drug is usually prescribed as a last resort to schizophrenic patients who fail to show acceptable response to the conventional antipsychotics (Motsinger et al., 2003). Anticholinergic effects lead to confusion, memory impairment, blurred vision, urinary retention, constipation and dry mouth (Ryan, 2003).

Clozapine causes drooling in about 30 to 35% of patients. This drooling occurs more frequently at night because patients are unable to swallow as much as they do during the day (Wirshing, 2001). On rare occasions patients have reported an intensification of dream activity. Rapid eye movement (REM) sleep was found to be increased to 85% of the total sleep time. In those patients REM sleep occurred almost immediately after falling asleep. As with typical antipsychotics, clozapine increases delta and theta activity and slows dominant alpha frequencies. Enhanced synchronization occurs, and sharp wave activity and wave complexes may also develop (CPS, 2007).

Haematopoietic reactions are more likely to occur with clozapine. An increased risk of myocarditis, pericardidis, pericardial effusion and cardiomyopathy, heart failure, myocardial infarction and mitral insufficiency have been reported in association with clozapine and sometimes fatalities have occurred. Other adverse events include: orthostatic hypotension with or without syncope, tachycardia, ECG repolarization, congestive heart failure, sudden unexplained death, Neuro Malignant syndrome, tardive dyskinesia, drowsiness/sedation (39%), dizziness/vertigo (19%), headache, tremor, syncope, disturbed sleep/nightmares, restlessness, hypokinesia, agitation, rigidity, akathisia, confusion, fatigue, insomnia, hyperkinesia, weakness, lethargy, ataxia, slurred speech, depression, epileptiform movements/myoclonic jerks, anxiety, chest pain, angina, ECG change/cardiac abnormality, constipation, nausea, abdominal discomfort/heartburn, nausea/vomiting, diarrhea, liver test abnormality, anorexia, urinary abnormalities, incontinence, abnormal ejaculation, urinary urgency/frequency, urinary retention, salivation, sweating, dry mouth, visual disturbances, rash, muscle weakness, pain (back, neck, legs), muscle spasm, muscle pain, ache, throat discomfort, dyspnea, shortness of breath, nasal

congestion, leucopenia/decreased WBC/Neutropenia, Eosinophilia, fever, weight gain, tongue numbness or soreness (CPS, 2007).

The 10 most frequently reported side effects in the CPS, 2007 manual include salivary hypersecretion, somnolence, weight increase, anxiety, depression, dizziness (excluding vertigo), psychotic disorder, suicidal ideation, constipation, and insomnia. Other adverse events that were reported at a rate lower than 1% are loss of speech, anemia, tics, poor coordination, delusions/hallucinations, involuntary movement, stuttering, dysarthria, amnesia/memory loss, histrionic movements, libido increase or decrease, paranoia, shakiness, parkinsonism, irritability, edema, palpitations, phlebitis/thrombophlebitis, cyanosis, premature ventricular contraction, bradycardia and nose bleed, ischemic changes, arrhythmias, abdominal distention, gastroenteritis, rectal bleeding, nervous stomach, abnormal stools, hematemesis, gastric ulcer, bitter taste and eructation, dysmenorrhea, impotence, breast pain/discomfort, vaginal itch/infection, numbness, polydypsia, hot flashes, dry throat, mydriasis, pruritus, pallor, eczema, erythema, bruise, dermatitis, petechiae and urticaria, twitching, coughing, pneumonia/pneumonia like symptoms, rhinorrhea, hyperventilation, wheezing, bronchitis, laryngitis, sneezing, leukocytosis, chills/chills with fever, malaise, appetite increase, ear disorder, hypothermia, eyelid disorder, blood shot eyes, nystagmus. Other voluntary reports include: delirium, exacerbation of psychosis, myoclonus, overdose, paresthesia, possible mild cataplexy, status epilecticus, acute pancreatitis, dysphagia, fecal impaction, intestinal obstruction/paralytic ileus, salivary gland swelling, cholestasis, hepatitis, jaundice, nephritis, hypersensitivity reactions, photosensitivity, vasculitis, erythema multiforme, Stevens-Johnson syndrome, hyperglycemia, ketoacidosis,/hyperosmolar coma, hyperuricemia, hyponatremia, weight loss, impaired glucose tolerance, diabetes aggravated, hypercholesrolemia and hypertriglyceridemia, myasthenic

syndrome, rhabdomyolysis, aspiration, pleural effusion, respiratory arrest, deep vein thrombosis, elevated haemoglobin/hematocrit, ESR increased, pulmonary embolism, sepsis, thrombocytosis, thrombocytopenia, thrombocythaemia, narrow angle glaucoma and CPK elevation (CPS, 2007).

Issues in the Use of Antipsychotics

The numerous adverse events found in the newer antipsychotic drugs may offset their advantages. Improvements in symptoms do not necessarily lead to improvement in overall quality of life for patients and their caregivers (Ballard et al., 2001). It is commonly accepted that all drugs have risks that must be accepted along with their benefits but at what cost (Gill et al., 2007). Some researchers have concluded that antipsychotic use in dementia has been excessive, inappropriate, and poorly monitored (Lawlor, 2004).

A 3-month randomized placebo controlled antipsychotic (neuroleptic) discontinuation study was conducted to assess the benefits of stopping the use of antipsychotic medication in people scoring below the median score for behavioural symptoms at baseline. Impact on quality of life was also examined. Most patients with dementia (67%) who had stable behaviour and had been receiving an antipsychotic for more than 3 months did not experience deterioration in behavioural symptoms when the treatment was discontinued. Patients who scored lower than 14 on the NPI had a better outcome with regard to agitation and showed a trend towards a reduction in developing behavioural problems. Those who scored higher than 14 however, were significantly more likely to develop marked behavioural problems if they did not continue to receive antipsychotic treatment. Thus discontinuing antipsychotic treatment in patients with a lower NPI score does not appear to exacerbate behavioural symptoms. Given the numerous side effects of these medications this study supports discontinuing treatment in some patients (Ballard et al., 2004).

A 1-year follow-up study of the BPSD in care environments found high rates of spontaneous resolution. Agitation resolved independently of medication in 45% of the cases, delusions resolved independently in 60% of the cases and depression in 60% of the cases. Thus prescribing antipsychotic medications for long period of time might not be necessary. Short periods of intervention targeted at specific symptoms may be more effective and much less harmful to the patient (Ballard et al., 2001).

Another 1-year prospective study found no difference in the duration of symptoms between those taking and not taking antipsychotics. Given that most controlled trials of antipsychotic drugs last on average 3 months it is interesting to read in this study that a large proportion of behavioural incidents lasted less than 3 months. In this study, 53% of the patients not taking antipsychotics experienced resolution of their psychotic symptoms and no significant differences in resolution rates were found between the different types of dementia (Ballard et al., 1997).

Although the elderly constitute 14% of the United States population, they are prescribed over one-third of all prescription medications. Nursing home patients are prescribed on average 8 medications. Unfortunately, adverse drug events are not always recognized as such and are consequently treated as a new medical condition resulting in a prescribing cascade that further increases the risk of adverse drug reactions. There is also a problem of inappropriate drug use in the elderly. Up to 40% of nursing home residents in the United States were prescribed an inappropriate drug. In the medicare registrants of Quebec, 56% of 63 268 elderly were found to have a high risk prescribing issue such as: the use of questionable drug combination, excessive treatment duration and the use of contraindicated medications for the use in the elderly (Shelton, Fritsch & Scott, 2000).

Purpose of the Study

The purpose of this study is to examine the frequencies and the structure of scores on MDS (2.0) items relevant to disruptive behaviour and antipsychotic medications in elderly residents in LTC homes. Two previous RAI studies found that disruptive behaviour was predicted in regression analysis by several MDS items including antipsychotic medications, bladder incontinence, depression, delirium, restraint use and Activities of daily living or ADLs (Stewart, 2005; Stones et al., 2003). Limitations of these studies included (a) failure to account for relationships among the predictor variables and (b) failure to account for an anticipated bidirectional relationship between disruptive behaviour and the use of antipsychotics.

Anticipation of a bidirectional relationship between disruptive behaviour and antipsychotic use occurs because high levels of disrupted behaviour are a reason to prescribe antipsychotics whereas the postulated effects of the latter include a lowering of disruptive behaviour. Consequently, any regression of antipsychotic use (as predictor variable) on disruptive behaviour (as predicted variable) provides a regression coefficient that confounds positive and negative trends. The present study attempted to disentangle this confound by using LISREL path analysis to test the hypothesized bidirectional relationship of negative antipsychotic on disruptive behaviour and positive disruptive behaviour on antipsychotic trends.

Other predictors of disruptive behaviour specified in the LISREL model derived from reviews of the literature by Stewart (2005) and Stone, Stewart & Kirkpatrick (2003). The direct predictors of disruptive behaviour included delirium, depression, and bladder incontinence all of which are sources of distress or discomfort. Other continuous measures reported in the literature as correlates of disruptive behaviour included cognitive impairment, activities of daily living, and physical restraint. The model specified the following positive effects among these measures:

cognitive impairment on delirium and physical restraint, delirium on physical restraint and depression, and impaired activities of daily living on physical restraint (i.e., because the latter's use in the context of safety of physically impaired residents). Finally, the model specified a negative effect of impaired activities of daily living on antipsychotic use because of termination of the latter at the highest levels of activities of daily living impairment.

Variables cited in the literature as correlates of disruptive behaviour but not included in the LISREL analysis included measures that violate assumptions of continuity required by the model (e.g., noncontinuous measures such as diagnostic category).

Method

Participants

Participants included 1479 frail elderly and disabled adults residing in LTC facilities in Ontario during 2000. Data were collected as part of an Ontario-wide Resident Assessment Instrument Health Infomatics Project (RAIHIP). Although data collection was below census level except in a minority of long-term care homes, it remains the largest and most carefully collected data base in the province to date.

Material

The Minimum Data Set 2.0 (MDS 2.0) from 2000 was the key data source. The MDS 2.0 is the main functional assessment of the Resident Assessment Instrument (RAI). It includes several domains such as activities of daily living (ADLs), nutrition, continence, behaviour and cognition. The RAI is a tool that provides a comprehensive assessment of the individual patient. It is designed to monitor the individual status and progress of the medical, psychological and social characteristics of residents within care facilities. It has demonstrated a good interrater reliability (Shelton et al., 2000). The assessment is administered upon admission into a facility

and in quarterly assessments thereafter by trained nursing staff. Findings support the reliability and clinical utility of the MDS 2.0 (Morris et al., 1997).

Dependent Variables

The dependent variables (DV) included in the model consisted of the Disruptive Behaviour Scale, antipsychotic use, delirium and restraint use. The MDS Disruptive Behaviour Scale (Stones et al., 2003) includes the behavioural symptoms on the MDS (2.0). The items include verbally abusive behaviour by residents, physically abusive behaviour by residents, socially inappropriate behaviour and resistance to care. These items measure the frequency of the resident's behaviour within the last 7 days. Scores are based on a 4-point scale, where 0 means *behaviour not present*, 1 means *behaviour was present 1-3 days*, 2 means *behaviour occurred in 4-6 days*, and 3 means *behaviour occurred daily.* The items also measure the alterability of the behaviour in the last 7 days. These items are scored on a 2-point scale, such that, 0, means *residents' behaviour was easily altered or not present* and 1 means *behaviour was not easily altered.* The scoring on the Disruptive Behaviour Scale is the sum of each of the frequency and alterability of resident's behaviour. Scores can range from 0 to 16. Internal consistency estimates of reliability for this scale determined that the scale has good reliability (coefficient alpha = .835).

Antipsychotic use was coded according to 0 = *not received in the last 7 days and number of days* (1 to 7) if it was received in the last 7 days. Long acting medications are included even if used less than weekly.

Delirium was coded as the behaviour being present in the last 7 days in that 0 = *Behaviour not present*, 1 = *Behaviour present, not of recent onset*, 2 = *Behaviour present, over last 7 days appears different from resident's usual functioning* (e.g., new onset or worsening). It

included whether the resident was easily distracted (e.g., difficulty paying attention, gets sidetracked); if the resident had periods of altered perception or awareness of surroundings (e.g., moves lips or talks to someone not present; believes he or she is somewhere else; confuse night and day); episodes of disorganized speech (e.g., speech is incoherent, nonsensical, irrelevant, or rambling from subject to subject; loses train of thought); periods of restlessness (e.g., fidgeting or picking at skin, clothing, napkins, etc.; frequent position changes, repetitive physical movements or calling out); periods of lethargy (e.g., sluggishness, staring into space, difficult to arouse, little bodily movement) and whether mental function varied over the course of the day (e.g., sometimes better, sometimes worse; behaviours sometimes present, sometimes not).

Restraints was coded according to their use in the last 7 days whereas 0 = *Not used*, 1 = *Used less than daily* and 2 = *Used daily*. They include trunk restraint, Limb restraint and chair that prevents rising. Residents are assessed by direct observation and in consultation with other staff members and records.

Predictors

The independent variables (IV) included ADL self-performance and support, Depression Rating Scale, Cognitive Performance Scale and bladder incontinence.

Activities of daily living (ADL) refer to the residents' self-performance on the MDS (2.0) in the last 7 days. Physical functioning and structural problems include ADL self-performance and support provided. Self-performance was rated on a 6 point scale where 0 = *Independent*, 1 = *supervision*, 2 = *limited assistance*, 3 = *extensive assistance*, 4 = *total dependence*, and 8 = *activity did not occur*. Support provided was rated on a 5-point scale where 0 = *no help from staff*, 1 = *set up help only*, 2 = *one person assist*, 3 = *2 or more person assist*, and 8 = *activity did not occur*.

Depressed affect is coded for indicators observed in the last 30 days, irrespective of the assumed cause. Indicators include verbal expression of distress, sleep-cycle issues, sad, apathetic or anxious appearance and loss of interest. Residents are scored on a 3-point scale where 0 = *indicator not exhibited in last 30 days*, 1 = *indicator of this type exhibited up to 5 days a week*, and 2 = *indicator of this type exhibited daily or almost daily* (6, 7 days).

Cognitive impairment includes a resident's short term and long term memory, and assesses whether the resident has memory problems. It also assesses recall abilities such as current season, location of their own room, staff names and faces, whether one knows they are in a facility or none recalled. Decision making abilities are assessed on a four-point scale where 0 = *independent*, 1 = *modified independence*, 2 = *moderately impaired* and 3 = *severely impaired.*

Bladder incontinence is measured in the last 14 days regardless of continence programs or appliances (e.g., Foley). Urinary continence performance is coded as 0 = *complete control*, 1 = *usually continent,* 2 = *occasionally incontinent*, 3 = frequently incontinent, 4 = *Incontinent,*

Results

Distribution of Variables

Results indicated that out of 1479 residents, 44% displayed some disturbing behaviour and that overall 25% of the residents used an antipsychotic medication in the last 7 days. It was also found that 75% of residents had bladder incontinence. Depressive symptoms were exhibited by 63% of the residents and 86% had some degree of cognitive impairment. Results also showed that a mere 0.9% of residents were physically restrained on a daily basis. Delirium or disordered thinking was displayed by 68% of the residents in the last 7 days.

Scores on the Disruptive Behaviour Scale determined that 830 residents (56%) displayed no disruptive behaviour while 649 (44%) showed varying degrees of disruptive behaviour (M =

1.69, *SD* = 2.53). Scores on the Disruptive Behaviour Scale range from 0 to 10 (see Figure 1).

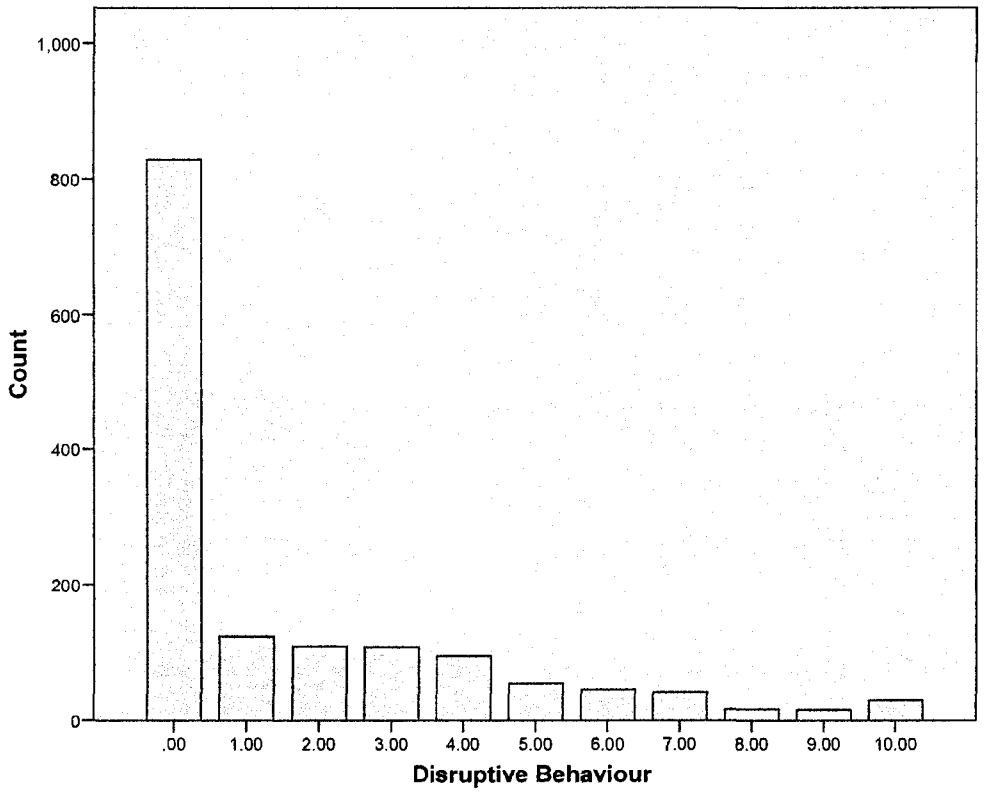

Figure 1. Frequency of disruptive behaviour ranging from none (0) to some (1 to 10).

Scores on the antipsychotic scale determined that upon admission1109 residents (75%) did not use an antipsychotic medication in the last 7 days. Whereas, 370 (25%) residents used an antipsychotic at least once in the last 7 days (*M* = 1.67, *SD* = 2.53).

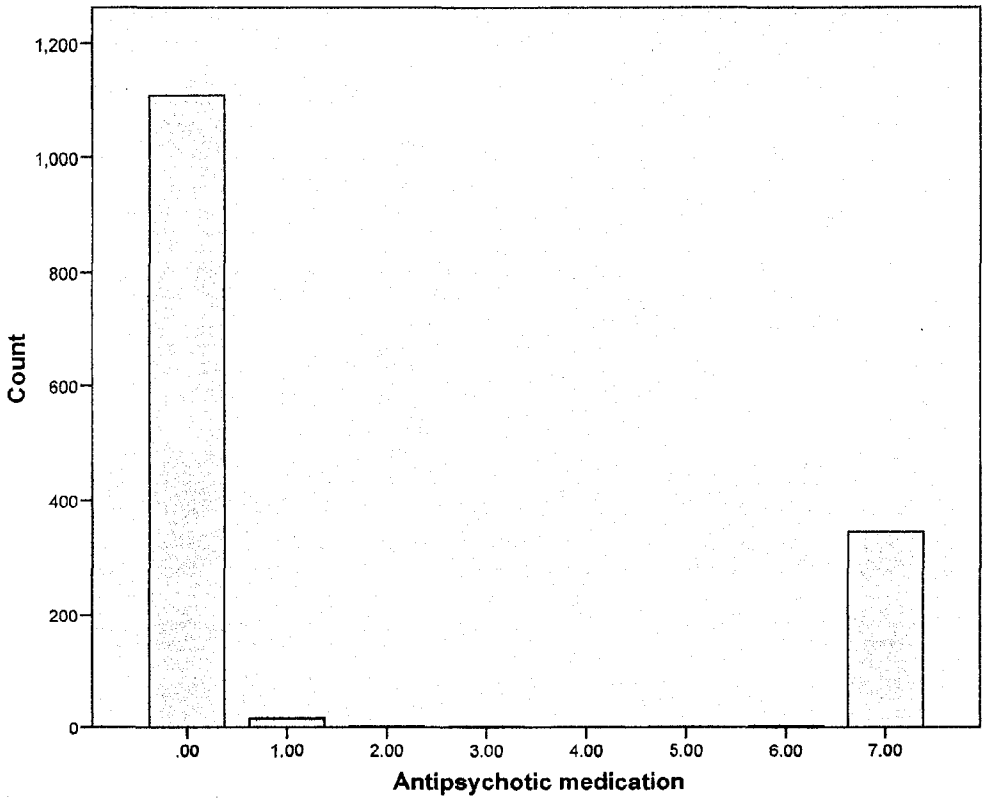

Figure 2. Antipsychotic use, 0 (not used), 1 to 7 (used in the last week).

Scores on the activities of daily living (ADL) assessment indicate a ($M = 9.21$, $SD = 5.30$). Scores can range from 0 to 8 in two categories. The first category includes a self-performance score where 0 means *resident is independent*, 1 = *needs supervision*, 2 = *limited assistance*, 3 = *extensive assistance*, 4 = *total dependence*, and 8 = *activity did not occur*. The second rates *support provided* where 0 = *no set up or physical help*, 1 = *set up help only*, 2 = *one*

person physical assist.

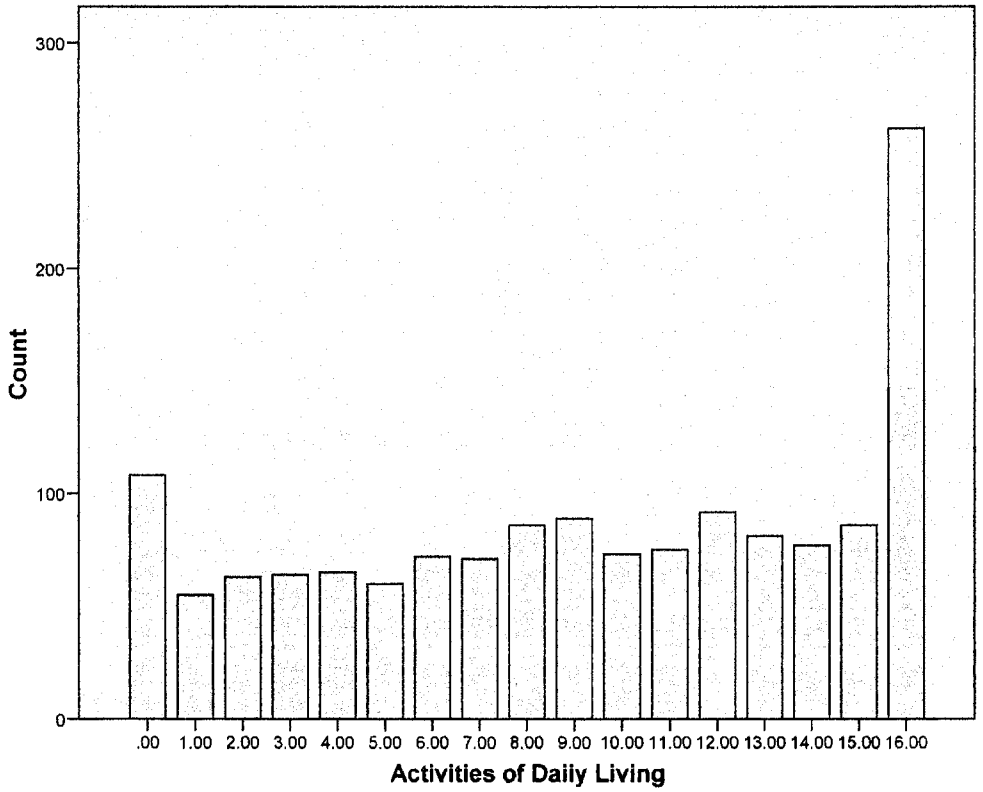

Figure 3. Activities of daily living.

Scores on the continence scale indicate that 365 (25%) residents had complete bladder control whereas 1114 (75%) were incontinent to some degree ($M = 2.52$, $SD = 1.70$).

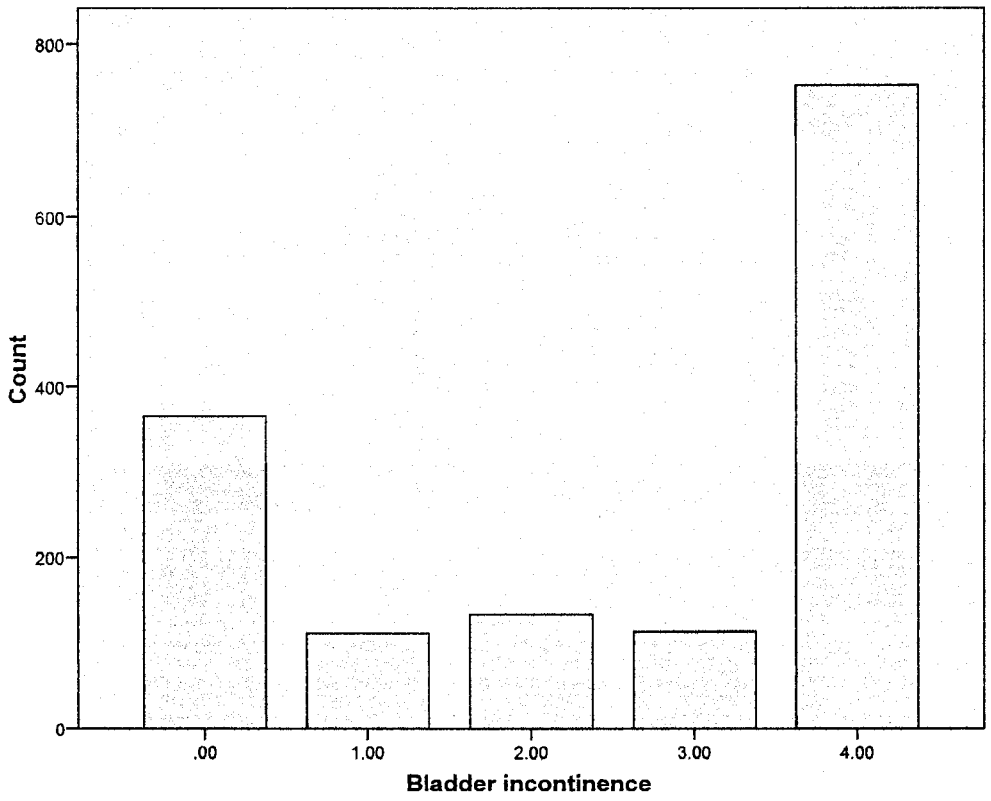

Figure 4. Indicates bladder continence in the last 14 days, 0 = *continent*, 1-4 = *incontinent.*

Scores on the Depression scale ranged from 0 to 14. Results indicate that 549 (37%) did not exhibit depressive symptoms whereas 930 (63%) exhibited some level of distress ($M = 2.03$, $SD = 2.42$).

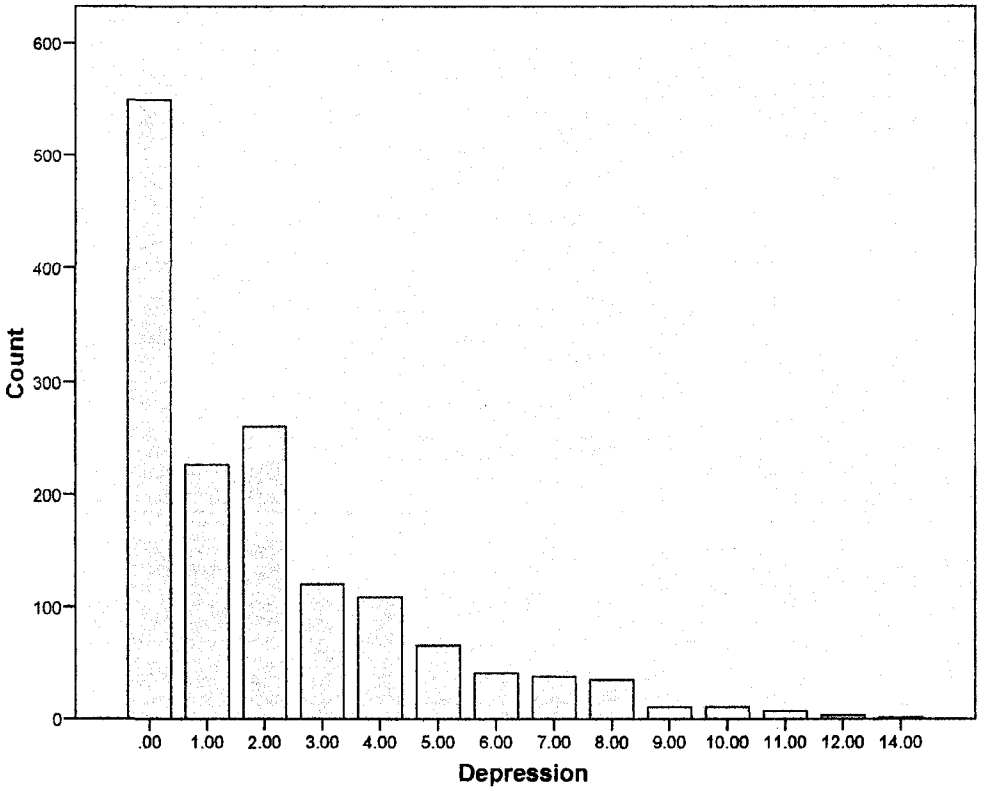

Figure 5. Depressive symptoms 0 = *not exhibited*, 1-14 = *exhibited.*

Cognitive Impairment with a minimum score of 0 and a maximum score of 6. Results indicate that 204 (14%) residents had no memory impairment while 1275 (86%) residents had some degree of memory impairment ($M = 3.21$, $SD = 2.03$).

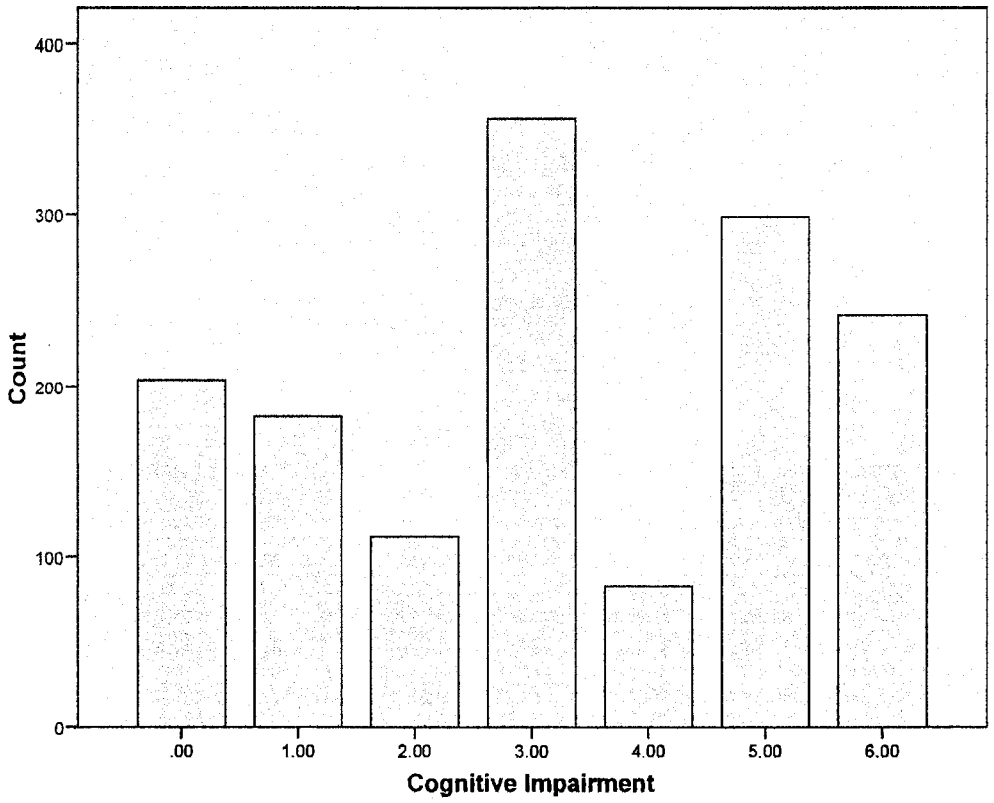

Figure 6. Cognitive patterns, 0 = *no memory impairment,* 1-6 = *memory impairment*

Restraint use found that in 1076 (73%) of the cases in was not used, in 389 (26%) of the cases it was used less than once daily and in 14 (0.9%) of the cases it was used daily (M = .28, SD = .47).

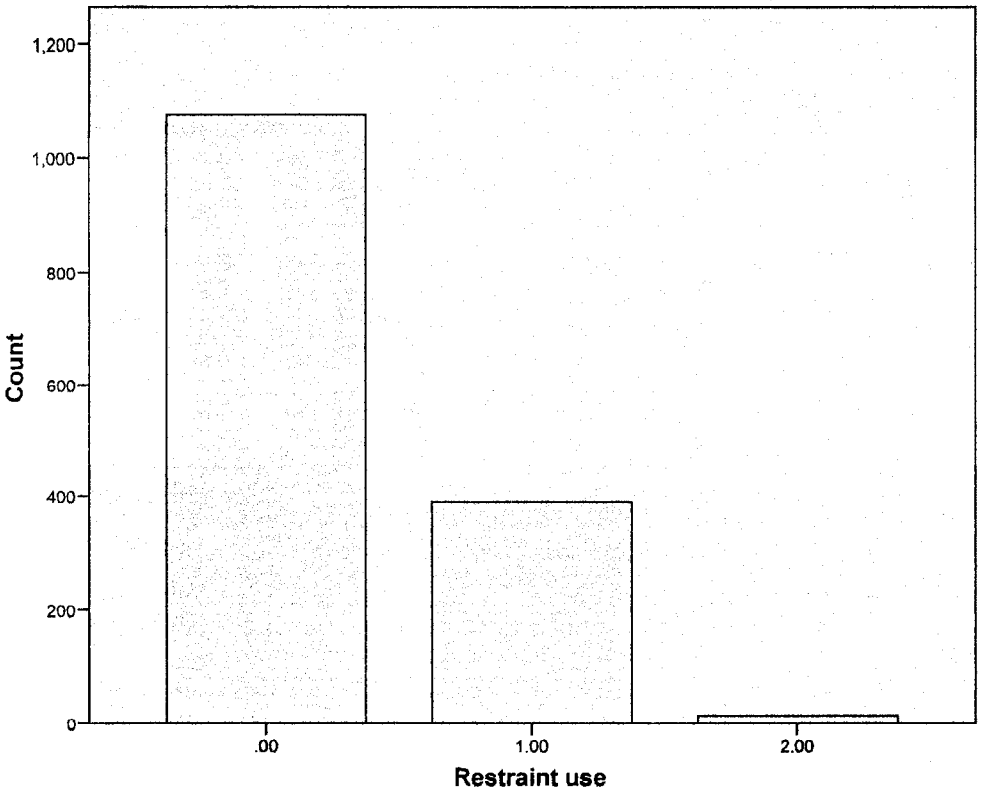

Figure 7. Restraint use, 0 = *not used*, 1 = *used less than daily* and 2 = *used daily.*

Delirium score ranged from 0 to 6. It was found that 471 (32%) did not display the behaviour and that 1471(68%) displayed some type of disorganized thinking or delirium (M = 2.27, SD = 2.05).

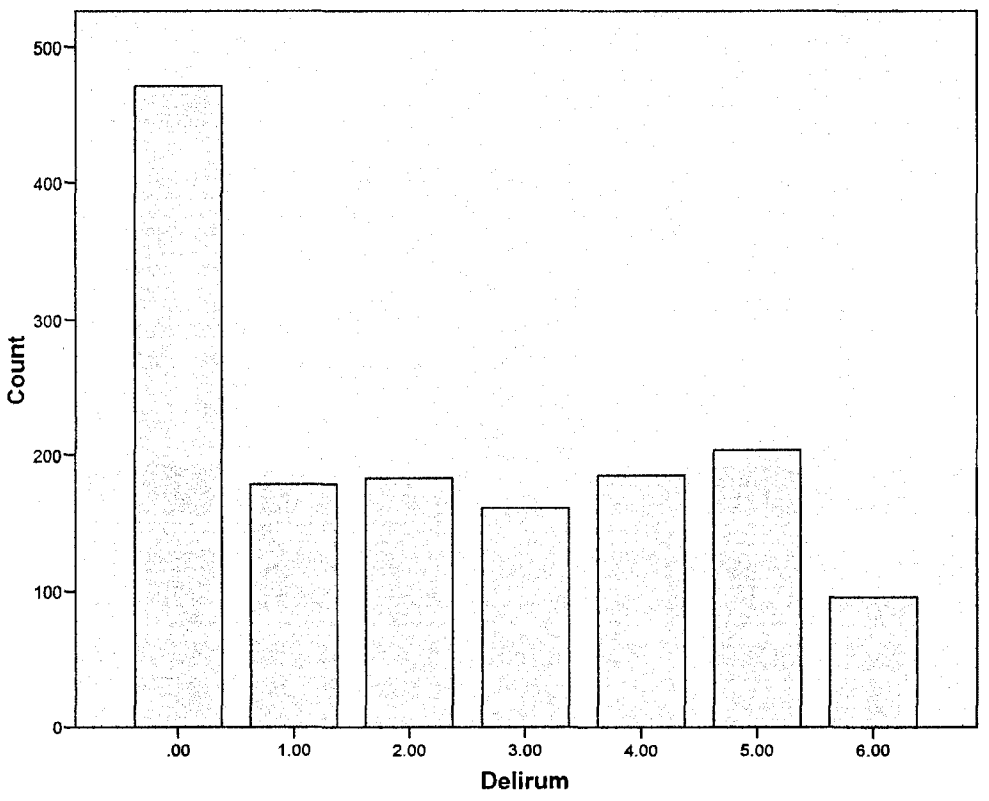

Figure 8. Delirium-periodic disordered thinking/awareness.

Correlations

The correlation matrix in Table 1 shows relationships (- or +) between the variables. Results indicate that disruptive behaviour was positively correlated with all the variables meaning that as disruptive behaviours increase so does everything else such as more antipsychotic use, more ADL assistance, more bladder incontinence, more depressive symptoms, more cognitive impairment, more restraint use, and more delirium.

Those who received an antipsychotic medication were more likely to display disruptive behaviour, to suffer from depression, to be cognitively impaired and to suffer from delirium. They were also more likely to require less assistance with ADL.

A higher level of assistance with ADL was associated with a greater display of disruptive behaviour, bladder incontinence, cognitive impairment, restraint use and delirium and again those with greater ADL needs received less antipsychotic medications. Those displaying more bladder incontinence were also more disruptive, required more assistance with ADLs, had greater cognitive impairment, were most often restrained and suffered more delirium. Residents who displayed a greater amount of depressive symptoms were more likely to be disruptive, receive an antipsychotic medication and suffer from delirium. They were however less often restrained.

Those with greater cognitive impairment were most often disruptive, given antipsychotic medications, required more assistance with ADLs, were more likely bladder incontinent, were most often restrained, and suffered more delirium. Restraint use was associated with greater disruptive behaviour, bladder incontinence, cognitive impairment, delirium and more assistance needed with ADLs. Restraint use however was associated with lower levels of depressive symptoms.

As with disruptive behaviour, delirium was positively correlated with all of the variables. As delirium increases so does disruptive behaviour, antipsychotic medications use, ADL needs, bladder incontinence, depression, cognitive impairment and restraint use. It is interesting to note the relationship between antipsychotic medications and ADL. According to these results, the more independent residents are with ADL the more antipsychotic medications they receive. This relationship between ADLs and antipsychotic medications was also found in Lovheim et al. (2006). These authors concluded that the level of threat perceived by the staff was related to whether or not one received an antipsychotic.

Table 1

Correlation Matrix With the Predictors and Dependent Variables

	Disrupt	Antipsych	ADL	BladderInc	Depression	CognitImp	Restraint	Delirium
Disrupt	------							
Antipsych	.261**	___						
ADL	.171**	-.052*	____					
BladderInc	.164**	-.026	.620**	____				
Depression	.327**	.151**	.014	-.013	____			
CognitImp	.273**	.114**	.597**	.410**	-.043	____		
Restraint	.121**	.007	.503**	.311**	-.057*	.394**	____	
Delirium	.384**	.219**	.359**	.264**	.208**	.591**	.262**	_____

** correlation is significant at the 0.01 level

* correlation is significant at the 0.05 level

Path Analysis

A form of Structural Equation Modeling (SEM) called Path Analysis used the LISREL computer program. There are several advantages for the use of SEM. The relationships among variables have measurement error removed through estimation providing more accurate common variance. Reliability of measurement can be accounted for explicitly within the analysis by examining and removing the measurement error. SEM is the only analysis that allows complete and simultaneous tests of all the relationships (Tabachnick & Fidell, 2001).

The Hypothesized Model

A path analysis on MDS data, was performed through Lisrel on eight variables found to be of significance in previous research (Stones et al., 2003). The hypothesized model is depicted in Figure 8. The observed variables are represented by rectangles. The relationships between the variables are indicated by lines; the absence of a line implies that no direct relationship has been hypothesized. A line with one arrow represents a hypothesized direct relationship between two variables. A line with an arrow at both ends indicates a bidirectional relationship.

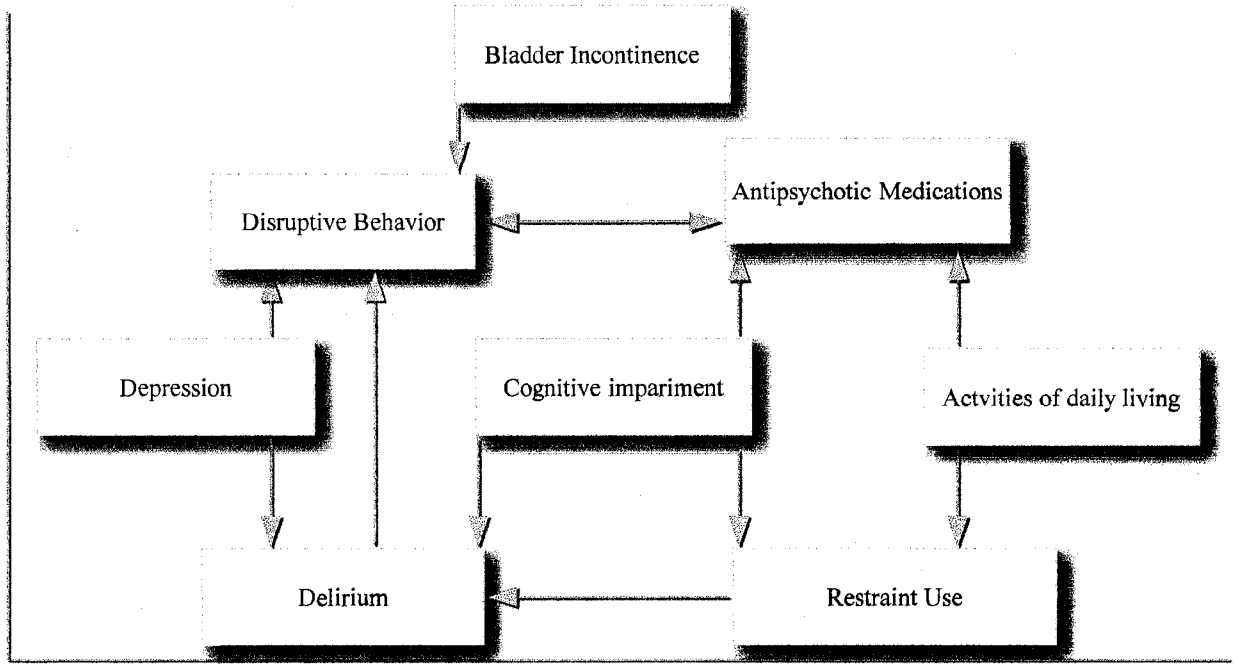

Figure 9: Path diagram of the hypothesized model

Figure 9: Path diagram of the hypothesized model.

Assumptions

All cases with nonhomogenous values on the variables were analyzed. There were no missing data.

Covariance Matrix

The analyzed data set consisted of the covariance matrix (see Table 2).

Table 2

Covariance Matrix Analysed Using LISREL Path Analysis

	Disrupt	Antipsych	Delirium	Restraint	ADL	Depression	CognImp	BladdInc
Disrupt	6.419							
Antipsych	1.957	8.781						
Delirium	1.996	1.333	4.211					
Restraint	.144	.010	.253	.222				
ADL	2.302	-.815	3.910	1.255	28.114			
Depression	2.010	1.084	1.034	-.065	.184	5.881		
CognImp	1.402	.681	2.455	.376	6.413	-.212	4.101	
BladdInc	.707	-0.131	.922	.249	5.599	-.055	1.414	2.902

Results of the initial hypothesized model are indicated in Table 3.

Table 3

Lisrel Estimates and Significant t Values

Predictor		Predicted	Parameter estimates	*t* values
Disruptive behaviour	→	Antipsychotic	.596	8.568
Cognitive impairment	→	Delirium	.591	26.639
Delirium	→	Disruptive beh	.455	12.765
Depression	→	Disruptive beh	.307	10.841
Antipsychotic	→	Disruptive beh	-.242	-4.431
Restrain	→	Delirium	.200	2.099
Depression	→	Delirium	.199	11.717
Cognitive impairment	→	Antipsychotic	.131	2.700
ADLs	→	Antipsychotic	-.108	-5.906
Bladder inc.	→	Disruptive beh	.094	2.395
ADLs	→	Restraint use	.037	14.948
Cognitive impairment	→	Restraint use	.034	5.250

Model Estimation

Maximum likelihood estimation was employed to estimate the model. The hypothesized model was tested and support was found, $\chi 2$ (10, N = 1479) = 42.16 (P = .000), Goodness of fit Index (GFI) = .993, Adjusted (GFI) = .975. Post hoc model modifications were performed in an attempt to develop a better fitting model. The improved model is shown here in Figure 10.

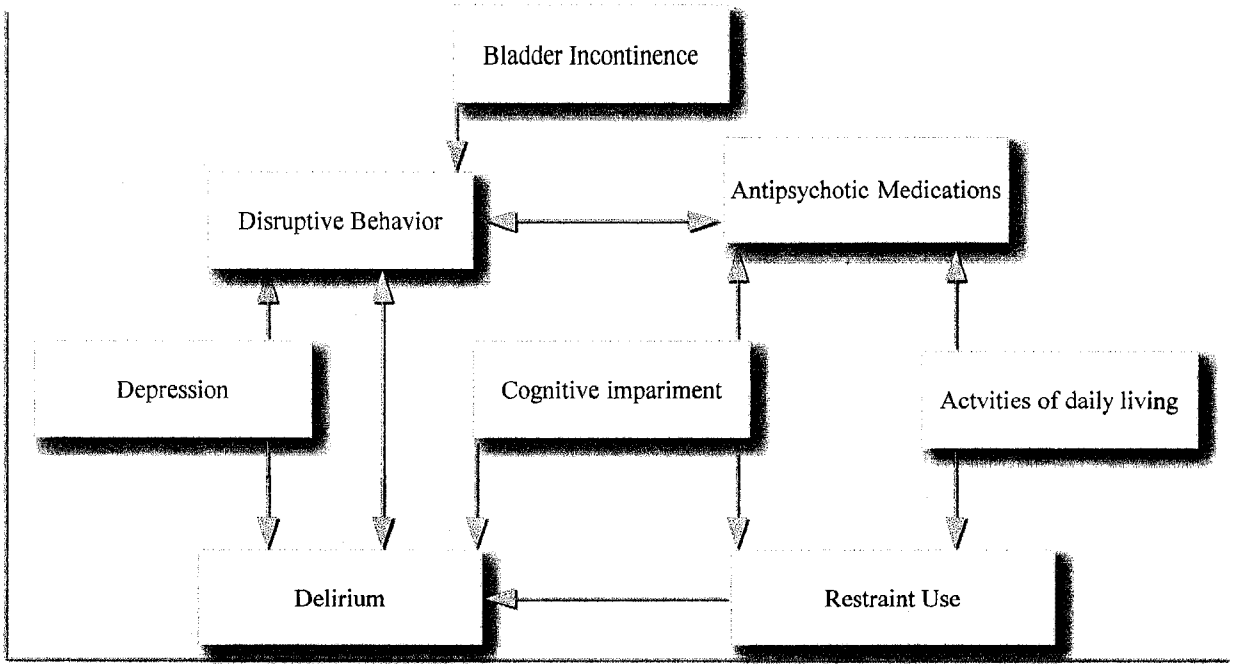

Figure 10: Path diagram of the final model

Figure 10. Path diagram of the hypothesized final model.

A path predicting disruptive behaviour from delirium was added and is now represented by two arrows which indicate a bidirectional relationship. Results from the chi-square difference test indicated that the model was significantly improved by this addition $\chi 2$ (1, N = 1479) = 21.034 $p < .01$. The model was re-estimated and found to be a good fit $\chi 2$ (9, N = 1479) = 21.08, $p < .01$, GFI = .996, AGFI = .986.

Table 4 depicts (in order of importance) the Lisrel estimates and t values for the final model.

Table 4

Lisrel Estimates and Significant t Values

Predictor		Predicted	Parameter estimates	*t* values
Delirium	→	Disruptive behaviour	.644	11.686
Cognitive impairment	→	Delirium	.642	24.195
Disruptive behaviour	→	Antipsychotic	.541	8.853
Depression	→	Disruptive behaviour	.269	9.249
Depression	→	Delirium	.252	11.465
Restraint use	→	Delirium	.226	2.218
Antipsychotic	→	Disruptive behaviour	-.215	-4.604
Cognitive impairment	→	Antipsychotic	.149	3.008
Disruptive behaviour	→	Delirium	-.148	-4.239
ADLs	→	Antipsychotic	-.107	-6.013
ADLs	→	Restraint use	.037	14.948
Cognitive impairment	→	Restraint use	.034	5.250

Results indicate that the path between bladder incontinence and disruptive behaviour is no longer significant. The added path between disruptive behaviour and delirium is significant and suggest that being disruptive might be adaptive in lowering delirium.

Discussion

All paths hypothesized to have a positive or negative effect were confirmed. The only unexpected finding was the negative effect of disruptive behaviour on delirium. As we can see in this model, the issue of disturbing behaviour and antipsychotic medications in the elderly is a complex one. Many variables play a role in disruptive behaviour. Although the path between bladder incontinence and disruptive was no longer significant upon improvement of the model, a positive correlation still exists. As was suggested in the literature review, unmet needs has been found to relate to disruptive behaviour. Thus staff ratios are very important in insuring that basic needs are met in a timely fashion. Increases in depressive symptoms were also found to have a positive effect on disruptive behaviour. Thus any effort aimed at reducing depressive symptoms in LTC residents should help reduce disruptive behaviour. As was mentioned in the literature review, efforts at reducing some of the causes of delirium such as medication intoxication, dehydration and infection should also impact disruptive behaviour since delirium and disruptive behaviour often co-occur.

A surprising and somewhat interesting finding was the negative effect found between disruptive behaviour and delirium. Reasons as to why disruptive behaviours reduce symptoms of delirium raises more questions than answers. For example: Does severity of delirium play a role in disruptive behaviour? If so, how much of a role does it play? Do all patients who become delirious end up being disruptive? If not, is there a difference between delirious individuals who display disruptive behaviour and those who do not? More research on this relationship is needed.

A strength of this study consisted of the statistical test employed. Lisrel Path Analysis allowed for several MDS 2.0 items, previously found to relate to disruptive behaviour, to be analyzed simultaneously. This allowed for a clearer picture to emerge because it took into

consideration the relationship among the variables and the bidirectional relationship between antipsychotic medications and disruptive behaviour and the bidirectional relationship between delirium and disruptive behaviour. Another strength of this study consisted of the large database provided by the MDS 2.0.

Limitations however included the year of the data. More recent data could have provided a different picture of the situation. Also, this dataset did not provide precisions with regards to antipsychotic medications. For example it did not indicate the type of antipsychotic (typical of atypical), the amount of time residents were receiving the antipsychotics, the dosage, or any side effects that might have been experienced as a result of the antipsychotics. The only information it provided is whether residents had received an antipsychotic medication in the last seven days or not. Another limitation was that this dataset did not specify the type of disturbing behaviour that warranted an antipsychotic medication. For example was the antipsychotic given for reasons of aggression or restlessness?

This study has raised some important issues with regards to the care and research of elderly residents in LTC. Although antipsychotics do have a negative effect on disruptive behaviour, they should be prescribed wisely. Non-pharmacological interventions could help address many of the variables included in the model and should be implemented.

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