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The Relationship Between Anticholinergic Medications and Mini-Cog Scores in Older adults Receiving Home Health Care

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Abstract

Objectives—To describe anticholinergic use patterns in older adult home health recipients and examine their relationship to evidence of cognitive impairment.

Design—Retrospective study.

Setting—A home health care agency in Eastern Washington.

Participants—Potential study subjects were 174 recipients of home health services between March 1, 2006 and October 1, 2006 who were at least 60 years of age and had been screened for cognitive impairment by the Mini-Cog. A random sample of 65 out of 75 patients who scored in the impaired range on the Mini-Cog and a random sample of 65 out of 99 patients who scored in the unimpaired range were included in the study.

Main Outcome Measure—Prevalence of anticholinergic medication use.

Results—The majority of participants (80.0%) were using a medication with anticholinergic effects; however, more participants were using weak anticholinergics (66.1%) than potent agents (33.8%). After controlling for age, caregiver presence, and marital status, participants who scored as cognitively impaired on the Mini-Cog were less likely to be taking a medication with anticholinergic properties (OR 0.34, 95% CI 0.13–0.94).

Conclusion—Although anticholinergic use was common in this older adult home health population, the majority of participants were using medications with weak anticholinergic activity, as opposed to potent ones. Participants with cognitive impairment were less likely to be using any medication with anticholinergic properties.

Keywords

Anticholinergic Medications; Cognitive Impairment; Home Health Care; Mini-Cog

Introduction

The potential adverse effects of anticholinergic medications in the older adult population are well studied. In addition to effects such as urinary retention, blurred vision, and constipation, anticholinergic activity in older adults is associated with central adverse effects such as sedation, confusion, delirium, and onset or worsening of cognitive impairment.[1–4] Despite known potential adverse consequences, anticholinergic use is still common in older adults, both in long-term care and community settings. Older studies have reported anticholinergic medication use prevalence of 34% to 59% in skilled nursing facility residents [5, 6] and 23% to 50% in older adults in ambulatory care.[6–8]

Medications with anticholinergic properties have the potential to exacerbate cognitive impairment in those already having difficulties.[1] The cholinergic deficit associated with Alzheimer's disease and some other dementias increases the potential for adverse effects from medications exhibiting anticholinergic properties, and affected patients are at heightened risk for exacerbation of cognitive deficits.[1] In addition, anticholinergic medications oppose the actions of cholinesterase inhibitors, the mainstay of drug therapy for dementia, potentially decreasing their efficacy.[9]

Home health care is a service provided to individuals whose medical problems would otherwise prevent them from remaining at home. Individuals receive home health care due to acute illnesses, long-term medical conditions, cognitive or physical disabilities, or terminal illness, and receive services ranging from assistance with one or more activities of daily living to skilled nursing care.[10] The Centers for Disease Control (CDC) reported that Alzheimer's disease accounted for 1% of the primary medical diagnoses of home health recipients in the United States in the year 2000.[11] It is not unreasonable to assume that dementia rates greatly exceed 1% in the home health population, given the exclusion of non-Alzheimer types of dementia in the CDC report, and the under-recognition of cognitive impairment in older adults in general. Rates of non-recognition in primary care settings have been reported to range from 50% to 70%.[12,13] The Mini-Cog, a brief cognitive screening tool, was developed to make detection of cognitive impairment in older adults easier for non-specialists.[14] The Mini-Cog has been validated in a population based sample [15] and detects cognitive impairment as well as the Mini-Mental State Exam (MMSE).[16] However, no studies have examined the relationship between poor performance on the Mini-Cog and anticholinergic medication use.

The objectives of this study were to describe anticholinergic use patterns in older adult home health recipients, and examine the relationship between Mini-Cog scores and anticholinergic medication use.

Methods

Study Design and Sample

This is a retrospective study utilizing the patient population of a home health care agency in eastern Washington State. Potential study subjects were home health patients who were at least 60 years of age and were screened for cognitive impairment with the Mini-Cog. This study was carried out in a home health care agency where this screening is recommended, though not required, as part of the routine admission process. Subjects enrolled in home health services between March 1, 2006 and October 1, 2006 were identified for inclusion if they had a complete medical record standardized to the Outcome and Assessment Information Set (OASIS) format.[17] During the enrollment period, 1056 subjects were admitted to the home health agency, with 174 receiving the Mini-Cog. Reasons for not screening were varied, and included patients already having a diagnosis of dementia, being too physically or mentally impaired to complete the Mini-Cog, or simply omission of screening by the healthcare provider overseeing the admission. Of those who were screened, 75 scored in the impaired range (0–2 points) and 99 scored in the unimpaired range (3–5 points). We decided, a priori, to collect data on 130 subjects, 65 who scored as impaired on the Mini-Cog and 65 who scored as unimpaired. A random sample of 65 subjects in each category were chosen for study inclusion.

Data Collection and Sources

Subject medical information and medication profiles were accessed through the home health agency medical records to collect data. Number of medical diagnoses, medication regimens, demographic information (age, sex, race, and marital status), caregiver information (number of caregiver hours each week and type of caregiver) were all recorded. The Mini-Cog was administered during the initial admission process, and results were recorded in the subject's electronic medical record.

The Mini-Cog—The Mini-Cog uses the combination of a three-word recall task and a clock drawing task used as distraction before word recall.[18] One point is given for each correctly recalled word. Two points are given for a normal clock drawing and no points are given for an abnormal clock drawing. Clocks are considered normal if the numbers 1 through 12 are present in the correct order, are clockwise, and are only included once; if two hands are present on the clock; and if one of the hands each points to 8 and 4, signifying the time 8:20. Out of the possible 5 points, a score of 0 to 2 suggests high likelihood, and a score of 3–5 points a low likelihood, of clinically significant cognitive impairment.[18]

Anticholinergic medication use—Complete medication regimens were recorded for each subject, including drug strength, frequency, and indication. Medication regimens were reviewed for use of medications with anticholinergic activity [See Appendix 1]. Anticholinergic medications were categorized as having definite anticholinergic activity (potent anticholinergics) or possible anticholinergic activity (weak anticholinergics). A list of medications considered to have definite and possible anticholinergic properties was adapted from lists published in three other studies.[7,19,20]

Statistical Analysis

Data analysis was performed using STATA statistical software, version 10.0. Demographic variables, number of medical diagnoses, and caregiver variables were compared between cases and controls using chi square tests for categorical data and t-tests for continuous data. We examined anticholinergic medication use in three ways: total anticholinergic medication use, weak anticholinergic medication use, and potent anticholinergic medication use. Subjects were considered anticholinergic users if they were prescribed at least one medication with anticholinergic properties. Likewise, subjects were considered potent or weak anticholinergic users if they were prescribed at least one medication with potent or weak anticholinergic properties, respectively. Chi square tests were used to compare the proportion of subjects who scored as impaired and not impaired on the Mini-Cog who were users of any, potent, and weak anticholinergics. Three separate logistic regression models were used to examine the association between the three types of anticholinergic use and Mini-Cog scores. Variables were included in the regression model if they were significant at the $p = 0.15$ level in the univariate analysis. We used a conservative 0.15 level to avoid excluding potential confounders.

Results

The average study subject was a 79 year-old female (Table 1). Study subjects were predominantly white (97.7%) and non-married (60.0%). The mean number of medications used per subject was 11.4 (± 5.4) per day, ranging from 1 to 31. Total medication use did not differ between the two groups (10.7 for those with Mini-Cog scores 0–2 and 12.1 for those with Mini-Cog scores 3–5, $p=0.13$). Table 1 shows the total number of non-anticholinergic medications used. An average of 60.1 (± 61.7) hours of care were provided each week to 114 (87.7%) of the study subjects, with the majority of study subjects (66.7%) relying on family members for care. The average Mini-Cog score was 1.0 (± 0.9) for low scorers and 4.2 (± 0.8) for high scorers.

Anticholinergic use

A total of 104 subjects (80.0%) were using a medication with anticholinergic effects (Table 2). The majority of anticholinergic users (58.6%) were using two or more agents. The average number of anticholinergics used per person was 1.6 (± 1.2). Medications with weak anticholinergic activity (1.1 ± 1.0 per subject) were more commonly used than medications with potent anticholinergic activity (0.5 ± 0.7 per subject).

Medications with potent anticholinergic activity were used by 44 subjects (33.8%) (Table 2). Eleven of those (25.0%) were using multiple potent anticholinergics. Eight subjects (18.2% of potent anticholinergic users) were using two potent agents while three (6.8% of potent anticholinergic users) were using three or more. The most common potent anticholinergics were promethazine, used by 7 subjects (5.3%) and tolteridine, used by 6 subjects (4.6%).

Medications with weak anticholinergic activity were used by 86 subjects (66.1%) (Table 2). Forty-one subjects (47.7% of weak anticholinergic users) were using multiple weak agents. Of those, 25 subjects (29.1% of weak anticholinergic users) were using two agents and 16

(18.6 of weak anticholinergic users) were using three or more. Cardiovascular agents were the most commonly used medications with weak anticholinergic properties, with 45 people using furosemide, 33 using warfarin, and 20 using digoxin. Twenty people were also using ipratropium. Table 2 lists potent and weak anticholinergic medications used by at least 5 study participants.

Relationship between anticholinergic medication use and Mini-Cog scores

In the bivariate model, subjects who scored as cognitively impaired on the Mini-Cog were less likely to be taking any medication with anticholinergic properties including those agents with only weak anticholinergic effects (Table 1). When weak and potent anticholinergic medications were examined separately, there was no difference in potent anticholinergic use, indicating that the difference in total use was accounted for by medications with weak anticholinergic properties. Because those who scored as cognitively impaired were also older, more likely to be married, and more likely to have a caregiver, we controlled for these factors as potential confounders in the multivariate model. After controlling for potential confounders, subjects who scored as cognitively impaired on the Mini-Cog remained less likely to be taking any anticholinergic medication (OR 0.34, 95% CI 0.13–0.94) (Table 3) and less likely to be taking a weak anticholinergic medication (OR 0.40, 95% CI 0.17–0.92) (Table 4).

Discussion

Anticholinergic use was common in this older adult home health sample, with 80% taking at least one such medication. The majority of use consisted of medications considered to have weak anticholinergic properties. Those who scored as cognitively impaired in our study were less likely to be taking a medication with anticholinergic properties, after controlling for potential confounders, than their non-cognitively impaired counterparts. When we examined medications with weak and potent anticholinergic properties separately, the difference in weak anticholinergic use remained significant. There was no difference in potent anticholinergic use or in total number of medications used.

Because older adults with dementia are especially sensitive to anticholinergic effects of medications, limiting use of anticholinergic agents in this group is considered a best practice. Previous studies have shown higher use [7] or no difference in anticholinergic medication use [8] in older adults with dementia compared to those without dementia. Our findings, though promising in that we found decreased anticholinergic use in older adults with cognitive impairment, are tempered by the equal use of potent anticholinergic medications in those with and without cognitive impairment. The use of certain medications with anticholinergic properties is expected in the treatment of chronic disease, thus not all anticholinergic use is inappropriate. For example, three of the most commonly prescribed agents in our study, furosemide, warfarin, and digoxin, are essential to treat heart failure or atrial fibrillation. However, judicious prescribing should result in limited potent anticholinergic use. If a medication with anticholinergic properties must be prescribed for an older adult, a weak anticholinergic is preferred over a potent one.

The rate of anticholinergic drug use (80% of those studied here) is high compared to general prevalence reports ranging from 28% to 55%. [7,8,21] Comparing studies examining anticholinergic use is difficult, however, as the list of anticholinergic agents often varies from study to study. We attempted to address differences in anticholinergic potency by categorizing medications as having weak or potent anticholinergic properties. Our inclusion of medications with weak anticholinergic properties, especially warfarin, digoxin, and furosemide, may be responsible for our considerably higher prevalence rate of 80%. Although not typically considered anticholinergic medications, these agents have been shown to exhibit measurable anticholinergic effects. [22] On the lower end of other studies, Roe et al found that 28.2% of community based older adults were taking an anticholinergic medication, [7] however, they did not include warfarin, digoxin, or furosemide, the top three agents identified in our study. Schubert and colleagues reported that 50% of older adults with dementia and 55% of those without dementia attending a primary care clinic were taking at least one anticholinergic medication. [8] Furosemide was considered an anticholinergic medication in the Schubert study, but warfarin was not.

Other reasons for the differences between this and other studies may be related to our select home health sample or to changes in prescribing trends. Older adults receiving home health care likely represent a sicker population than community-dwelling older adults, resulting in more chronic disease treatment and greater use of weak anticholinergic medications. The average total medication use in our study exceeded that generally found in other studies of older persons. Subjects in our study were taking an average of 11.4 prescription medications compared to 5.1 to 6.2 in other studies. [7,8,20] Our study confirms results of a recent study conducted in a similar setting [23] that found fewer homebound older adults with dementia (62%) were prescribed a medication with anticholinergic properties than those without dementia (80%). Overall, 72% of older adult home health patients in that study were using an anticholinergic medication, a result more closely resembling our finding of 80%.

Prescribers are educated regarding the risks of medications with anticholinergic properties and taught to minimize or avoid such agents in older adults. [24] Prescribers may therefore be less inclined to prescribe anticholinergic medications in their elder patients, resulting in a trend for reduced prescribing of these agents, especially in those with known or suspected cognitive impairment. Ideally, appropriate education would differentiate medications with potent and weak anticholinergic effects, and lead to decreased use of potent ones. Our results suggest that this is not the case. Although those who scored as cognitively impaired were less likely to be taking an anticholinergic medication, prevalence of potent anticholinergic use was similar to reports of general anticholinergic use in older studies. [7,8,20]

There are several limitations to our study. First, we collected prescription medication information from medical charts and do not have information on the use of non-prescribed medications with anticholinergic properties or adherence. Second, we did not collect prescribing indications or length of therapy, limiting our ability to fully comment on the appropriateness of anticholinergic use. Third, our small sample size and select population limits our generalizability. Fourth, many patients admitted during the study enrollment period were not cognitively screened, which could have introduced sampling bias. Finally,

the cross-sectional nature of our study limited our ability to examine the direct effects of anticholinergic medication use on Mini-Cog scores.

Conclusion

Subjects in our study who scored as impaired on the Mini-Cog were less likely to be taking an anticholinergic medication, primarily due to decreased use of medications with weak anticholinergic properties. Although the prevalence of anticholinergic use in our study was high, weak anticholinergics were more commonly used than potent anticholinergic agents. Much of the use involved agents that are important in the treatment of chronic disease, and therefore likely appropriately prescribed despite having anticholinergic properties.

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Table 1

Baseline Characteristics, reported as n (%) unless otherwise specified

Characteristic	MiniCog score			p-value
	Total n (%) (n=130)	0–2 n (%) (n=65)	3–5 n (%) (n=65)	
Age (years), mean (SD)	79 (8.5)	81.5 (8.5)	76.5 (7.9)	<0.01
Gender (female)	89 (68.5)	44 (67.7)	45 (69.2)	0.85
Race (white)	127 (97.7)	63 (96.9)	64 (98.5)	0.57
Marital status (married)	52 (40.0)	30 (46.2)	22 (33.8)	0.15
Number of medical diagnoses, mean (SD)	8.2 (3.3)	8.1 (3.1)	8.4 (3.6)	0.65
Caregiver present	114 (87.7)	61 (93.8)	53 (81.5)	0.03
Caregiver type				
Nurse	8 (7.0)	4 (6.6)	4 (7.6)	
Aide	30 (26.3)	19 (31.2)	11 (20.8)	0.50
Family member	76 (66.7)	38 (62.3)	38 (71.7)	1.00
Total number of prescription medications, excluding anticholinergic medications, mean (SD)	9.8 (5.0)	9.28 (4.5)	10.49 (5.5)	0.17
Anticholinergic medication use				
Number of anticholinergic medications, mean (SD)	1.6 (1.2)			
Any use	104 (80.0)	47 (72.3)	57 (87.7)	0.03
Any potent anticholinergic use	44 (33.8)	21 (32.3)	23 (35.4)	0.71
Any weak anticholinergic use	86 (66.2)	37 (56.9)	49 (75.4)	0.03

SD = Standard deviation

Table 2

Anticholinergic Use (n=130)

Medication	N	%
Any anticholinergic	104	80.0
More than one agent	61	46.9
Two agents	32	24.6
Three or more agents	29	22.3
Any potent anticholinergic	44	33.8
More than one potent anticholinergic	11	8.5
Two potent agents	8	6.1
Three or more potent agents	3	2.3
Antihistamines		
diphenhydramine	5	3.8
Antiemetics		
promethazine	7	5.3
Antispasmodics		
tolterodine	6	4.6
Any weak anticholinergic	86	66.1
More than one weak anticholinergic	41	31.5
Two weak agents	25	19.2
Three or more weak agents	16	12.3
Antiulcerants		
ranitidine	6	4.6
Bronchodilators		
ipratropium bromide	20	15.4
Cardiovascular agents		
furosemide	45	34.6
warfarin	33	25.4
digoxin	20	15.4
isosorbide dinitrate	5	3.8
nifedipine	5	3.8

Table 3

Factors Associated with Low Mini-Cog Scores Using Multiple Logistic Regression.

Variable	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Age	1.08 (1.03–1.14)	1.09 (1.04–1.14)	1.08 (1.03–1.14)
Marital status	2.11 (0.95–4.69)	2.28 (1.02–5.10)	2.02 (0.93–4.40)
Caregiver present	3.27 (0.93–11.43)	2.81 (0.80–9.82)	3.29 (0.95–11.4)
Use of any anticholinergic medication	0.34 (0.13–0.94)	—	—
Use of a weak anticholinergic medication	—	0.40 (0.17–0.92)	—
Use of a potent anticholinergic medication	—	—	0.89 (0.40–1.97)

Three regression models are presented, examining any anticholinergic medication use, weak anticholinergic medication use, or potent anticholinergic medication use.

OR = Odds Ratio; CI = Confidence Interval

Appendix 1

Medications with Anticholinergic Properties

Medications with Definite Anticholinergic Activity (Potent Anticholinergics)	
Class	Specific Medications
Antidiarrheals	diphenoxylate/atropine.
Antihistamines	cyproheptadine, chlorpheniramine, dexchlorpheniramine, hydroxyzine, clemastine, diphenhydramine.
Antidepressants	amitriptyline, amitriptyline/chlordiazepoxide, amitriptyline/perphenazine, clomipramine, doxepin, imipramine, mirtazapine, nortriptyline, protriptyline, trazodone, paroxetine
Antipsychotics	chlorpromazine, clozapine, fluphenazine, haloperidol, mesoridazine, olanzapine, thioridazine, thiothixene, prochlorperazine, promethazine.
Antiemetics	dimenhydrinate, meclizine, prochlorperazine, promethazine, trimethobenzamide.
Antiparkinson agents	amantadine, benztropine, biperiden, trihexyphenidyl.
Antiarrhythmics	disopyramide, quinidine, procainamide.
Cardiovascular agents	Dipyridamole
Antispasmodics	Belladonna alkaloids, clidinium/chlordiazepoxide, dicyclomine, flavoxate, hyoscyamine, oxybutynin, propantheline, tolterodine.
Medications With Possible Anticholinergic Activity (Weak Anticholinergics)	
Antiulcerants	cimetidine, ranitidine.
Bronchodilators	Ipratropium bromide, theophylline, homatropine, tropicamide.
Cardiovascular agents	captopril, furosemide, isosorbide dinitrate, triamterene/hydrochlorothiazide, warfarin, digoxin, nifedipine.
Muscle relaxants	carisoprodol, chlorzoxazone, cyclobenzaprine, metaxolone, methocarbamol, orphenadrine.