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# Alzheimer's disease medication utilization patterns: Disparities in treatment initiation, non-adherence, and discontinuation

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## Abstract

**Background:** Although currently there is no disease-modifying treatment for Alzheimer's disease (AD), several FDA-approved prescription drugs may ameliorate AD symptoms. This study analyzed AD-targeted medication utilization patterns in a representative US population overall and by race and ethnicity.

**Method:** We analyzed use of cholinesterase inhibitors and memantine for AD, using data from the 2000-2014 Health and Retirement Study (HRS), linked with Medicare and Medicaid claims. We examined medication initiation among newly-diagnosed AD patients: 1) the proportion filling an AD prescription ≤90 and ≤365 days after diagnosis; 2) mean/median time from diagnosis to first AD prescription fill; and 3) AD symptom severity at treatment initiation, measured by cognitive and functional limitations. We measured AD medication non-adherence and discontinuation rates in the year following treatment initiation. We used logistic regression to examine whether AD medication initiation, non-adherence and discontinuation rates differed by race and ethnicity. We used HRS survey reports to compare the proportion of subjects not filling any prescription due to cost, by race and ethnicity.

**Result:** Among individuals with newly-diagnosed AD (n=1,299), 26% filled an AD prescription ≤90 days and 36% ≤365 days of diagnosis. These proportions and the median time from an incident AD diagnosis to first AD prescription fill did not vary by race/ethnicity. For 3 of 4 measures, AD severity at treatment initiation did not differ across racial/ethnic groups. Of all individuals who initiated AD-targeted treatment, 44% were non-adherent and 24% discontinued the medication during the year following treatment initiation. Non-Hispanic Blacks were more likely than non-Hispanic whites to not adhere to AD medication therapy (OR: 1.50 [95% CI: 1.07-2.09] or discontinue treatment (OR: 1.83 [95% CI: 1.27-2.63]). More non-Hispanic Blacks and Hispanics with AD reported ever not filling a prescription due to cost, compared to non-Hispanic whites (42% and 40% vs. 22%, p<0.01).

**Conclusion:** Initiation of AD-targeted medications among newly-diagnosed patients was suboptimal in all ethnoracial groups, with nearly two-thirds having no prescription for cholinesterase inhibitors or memantine during the first year post-diagnosis. Rates of AD medication non-adherence and discontinuation were substantial and may relate to cost and access to care.

**Figure 1: Unadjusted time to cholinesterase inhibitors or memantine initiation among older adults newly diagnosed with Alzheimer's disease (n=1,299)**

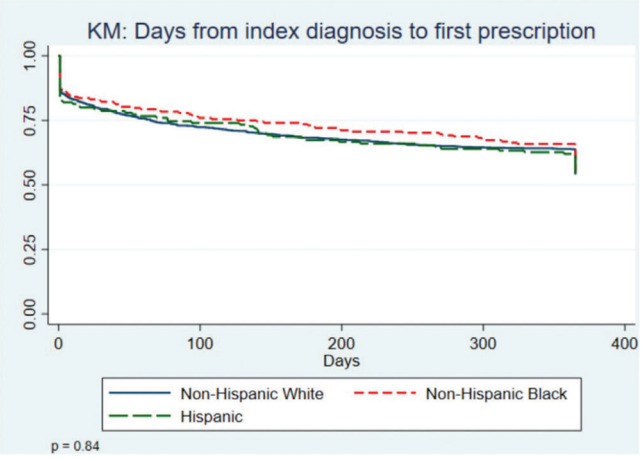


**FIGURE 1**

**TABLE 1**

**Table 1: Severity of Alzheimer's disease symptoms around the time of filling a prescription for cholinesterase inhibitors or memantine among newly diagnosed patients, by race and ethnicity**

| Mean (SD) | TICS score[1] (n=438) | p value | IQCODE score[2] (n=106) | p value | # of ADL limitations [3] | p value | # of IADL limitations [4] | p value |
|---|---|---|---|---|---|---|---|---|
| **Race/Ethnicity** | | p < 0.00 | | 0.14 | | 0.97 | | 0.96 |
| Non-Hispanic White | 15.9 | | 4.1 | | 1.1 | | 1.4 | |
| Non-Hispanic Black | 11.3 | | 3.7 | | 1.1 | | 1.4 | |
| Hispanic | 14.5 | | 4.1 | | 1.2 | | 1.4 | |

1. Only for participants who did not have a proxy respondent (self-reported). Scale from 0-35; Higher scores indicate higher cognitive function
2. Only for participants who had a proxy respondent. Scale from 0-5; Lower scores indicate higher cognitive function
3. ADL: Activities of Daily Living. Numbers are the reported number of activities (6 total) participants have difficulty performing; Lower scores indicate higher functional ability
4. IADL: Instrumental Activities of Daily Living. Numbers are the reported number of activities (5 total) participants have difficulty performing; Lower scores indicate higher functional ability

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**TABLE 2**

**Table 2: Odds ratios of filling a prescription for AD medications within 90 days after diagnosis**

| | Model 1 (N=1,299) | Model 2 (N=1,157) | Model 3 (N=1,156) |
|---|---|---|---|
| **Race and Ethnicity** | | | |
| Non-Hispanic White | Reference | Reference | Reference |
| Non-Hispanic Black | 0.77 (0.54, 1.11) | 0.74 (0.50, 1.11) | 0.72 (0.48, 1.10) |
| Hispanic | 0.90 (0.60, 1.34) | 0.88 (0.56, 1.37) | 0.87 (0.54, 1.39) |
| **Female vs. Male** | 1.05 (0.80, 1.37) | 1.07 (0.80, 1.43) | 1.04 (0.77, 1.40) |
| **Age** | | | |
| 65-74 | Reference | Reference | Reference |
| 75-84 | 1.38 (1.00, 1.91) | 1.25 (0.88, 1.79) | 1.25 (0.87, 1.79) |
| +85 | 0.83 (0.59, 1.18) | 0.67 (0.45, 1.00) | 0.67 (0.45, 1.00) |
| **Year of Diagnosis** | 1.03 (0.98, 1.08) | 1.00 (0.94, 1.05) | 1.00 (0.94, 1.06) |
| **Cognitive Impairment[1]** | | 1.28 (1.16, 1.40) | 1.27 (1.16, 1.40) |
| **ADLs[2]** | | 0.86 (0.77, 0.97) | 0.86 (0.77, 0.97) |
| **IADLs[3]** | | 0.97 (0.86, 1.10) | 0.98 (0.87, 1.10) |
| **Comorbidities** | | 0.97 (0.88, 1.07) | 0.97 (0.88, 1.07) |
| **Nursing home resident** | | 1.07 (0.69, 1.67) | 1.06 (0.68, 1.65) |
| **Medicare-Medicaid dually eligible** | | 0.78 (0.57, 1.07) | 0.76 (0.55, 1.06) |
| **Education** | | | |
| <High school | | | 1.06 (0.71, 1.59) |
| High school | | | 1.13 (0.78, 1.64) |
| >High school | | | Reference |
| **Income** | | | |
| Q1 ($0-$12,000) | | | 1.08 (0.69, 1.71) |
| Q2 ($12,000-$19,849) | | | 0.99 (0.65, 1.52) |
| Q3 ($19,849-$36,600) | | | 0.92 (0.62, 1.37) |
| Q4 ($36,600+) | | | Reference |

1. Cognitive impairment is on a 0-10 scale by using normalized TICS scores and IQCODES scores scaled to 10. IQCODES are for HRS participants who had a proxy respondent. 0: No impairment; 10: High impairment
2. Activities of Daily Living. Numbers are the reported number of activities (6 total) participants have difficulty performing; Lower scores indicate higher functional ability
3. Instrumental Activities of Daily Living. Numbers are the reported number of activities (5 total) participants have difficulty performing; Lower scores indicate higher functional ability

TABLE 3

**Table 3: Odds ratios of AD medication non-adherence and discontinuation**

| | Non-Adherence | | | Discontinuation | | |
|---|---|---|---|---|---|---|
| | Model 1 (N = 1,431) | Model 2 (N = 1,259) | Model 3 (N = 1,258) | Model 1 (N = 1,431) | Model 2 (N = 1,259) | Model 3 (N = 1,258) |
| **Race and Ethnicity** | | | | | | |
| Non-Hispanic White | Reference | Reference | Reference | Reference | Reference | Reference |
| Non-Hispanic Black | 1.37 (1.03, 1.82) | 1.47 (1.07, 2.02) | 1.50 (1.07, 2.09) | 1.73 (1.27, 2.38) | 1.89 (1.34, 2.66) | 1.83 (1.27, 2.63) |
| Hispanic | 1.43 (1.04, 1.97) | 1.34 (0.93, 1.92) | 1.39 (0.95, 2.05) | 1.32 (0.92, 1.90) | 1.27 (0.84, 1.92) | 1.18 (0.76, 1.83) |
| **Female vs. Male** | 1.02 (0.82, 1.27) | 1.16 (0.91, 1.48) | 1.17 (0.91, 1.51) | 1.15 (0.88, 1.49) | 1.20 (0.91, 1.59) | 1.19 (0.89, 1.59) |
| **Age** | | | | | | |
| 65-74 | Reference | Reference | Reference | Reference | Reference | Reference |
| 75-84 | 0.85 (0.65, 1.12) | 0.95 (0.71, 1.28) | 0.96 (0.71, 1.29) | 1.04 (0.77, 1.42) | 1.07 (0.77, 1.50) | 1.10 (0.79, 1.53) |
| +85 | 0.94 (0.71, 1.25) | 1.14 (0.82, 1.58) | 1.16 (0.83, 1.60) | 0.71 (0.50, 1.00) | 0.69 (0.47, 1.01) | 0.70 (0.47, 1.02) |
| **Year of first prescription** | 1.02 (0.99, 1.06) | 1.00 (0.96, 1.05) | 1.00 (0.96, 1.04) | 0.97 (0.93, 1.01) | 0.96 (0.91, 1.01) | 0.96 (0.91, 1.01) |
| **Cognitive impairment[1]** | | 0.94 (0.87, 1.01) | 0.94 (0.87, 1.02) | | 0.97 (0.89, 1.06) | 0.96 (0.88, 1.05) |
| **ADLs[2]** | | 1.04 (0.95, 1.15) | 1.04 (0.95, 1.15) | | 1.02 (0.91, 1.14) | 1.02 (0.91, 1.13) |
| **IADLs[3]** | | 0.97 (0.88, 1.07) | 0.97 (0.88, 1.07) | | 1.00 (0.89, 1.11) | 0.99 (0.89, 1.11) |
| **Comorbidities** | | 1.14 (1.05, 1.23) | 1.14 (1.05, 1.23) | | 1.09 (1.00, 1.20) | 1.09 (0.99, 1.19) |
| **Nursing home resident** | | 0.50 (0.35, 0.73) | 0.50 (0.34, 0.72) | | 0.68 (0.44, 1.04) | 0.69 (0.45, 1.07) |
| **Medicare-Medicaid dually eligible** | | 0.96 (0.73, 1.27) | 0.99 (0.74, 1.33) | | 0.76 (0.55, 1.05) | 0.74 (0.53, 1.03) |
| **Diagnosed with Alzheimer's disease** | | 0.57 (0.40, 0.81) | 0.56 (0.39, 0.81) | | 1.34 (0.88, 2.06) | 1.35 (0.88, 2.08) |
| **Education** | | | | | | |
| <High school | | | 0.96 (0.69, 1.33) | | 1.23 (0.84, 1.80) | 1.23 (0.84, 1.80) |
| High school | | | 1.05 (0.78, 1.42) | | 1.14 (0.80, 1.62) | 1.14 (0.80, 1.62) |
| >High school | | | Reference | | | Reference |
| **Income** | | | | | | |
| Q1 ($0-$12,000) | | | 1.15 (0.82, 1.60) | | 1.29 (0.87, 1.91) | 1.29 (0.87, 1.91) |
| Q2 ($12,000-$19,849) | | | 0.96 (0.67, 1.38) | | 1.36 (0.90, 2.07) | 1.36 (0.90, 2.07) |
| Q3 ($19,849-$36,600) | | | 1.01 (0.68, 1.49) | | 1.07 (0.67, 1.70) | 1.07 (0.67, 1.70) |
| Q4 ($36,600+) | | | Reference | | | Reference |

1. Cognitive impairment is on a 0-10 scale by using normalized TICS scores and IQCODES scores scaled to 10. IQCODES are for HRS participants who had a proxy respondent. 0: No impairment; 10: High impairment
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