Variation in Cost-Related Medication Non-Adherence with Functional Limitations and Frequency of Hospitalization in Older Adults

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Abstract

Cost remains a significant barrier to medications for millions of older Americans despite the institution of the Medicare Part D outpatient prescription drug program. We aimed to evaluate the association of cost-related medication non-adherence (CRN) with functional limitations and frequency of hospitalization among American adults 50 years or older using a nationally representative data set. We used 2010 data from the Health and Retirement Study. Americans 50 years or older were surveyed about their Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADLs), hospital admissions and CRN. Multivariate logistic regression analysis was conducted to assess the relationship between CRN and the number of functional limitations and hospitalizations controlling for socio-demographic variables and insurance status. Out of 20,776 older adults, 2,620 (12.6%) reported CRN. After controlling for insurance type and socio-demographic factors, our multivariate logistic regression analysis found that respondents with 1, 2, and 3 or more ADL limitations were 83%, 110%, and 143% more likely to report CRN than those without any ADL limitations, respectively (p<0.001), with similar but smaller impact of IADLs on CRN. Respondents with 1, 2, and 3 or more hospitalizations were 47%, 62%, and 106% more likely to report CRN than those without any hospitalizations, respectively (p<0.001). Older adults with greater numbers of functional limitations and hospitalizations are more likely to report CRN. CRN continues to be increased for sicker patients and should be the subject of future research to improve social policies and insurance benefit design with the goals of improving access to medications for this population.

INTRODUCTION

Cost remains a significant barrier to access to medications for millions of older Americans despite the institution of the Medicare Part D outpatient prescription drug program. The voluntary Medicare Part D plan offers outpatient prescription drug benefits for all 54 million Medicare beneficiaries in America as established by the Medicare Modernization Act of 2003 (MMA) [1]. However, disparities in access to medications and the prevalence of cost-related medication non-adherence (CRN) has remained or even worsened among the sickest patients [2-5]. Effective interventions to reduce CRN are lacking, particularly for patients with the highest disease burden.

Functional limitations and frequent hospitalization are known to be associated with high disease burden and poor outcomes among older persons [6]. However, the association of these factors with CRN in the general population has received little examination. Such associations may be important to practitioners, policymakers, and patients. Functional deficiencies and frequent hospital admissions may strain patients’ economic resources, increasing the likelihood of CRN, which can worsen health outcomes and increase requirements for future care.

In this study, we aim to assess the impact of functional limitations and frequent hospitalizations on CRN, using a nationally representative sample of adults 50 years or older. We hypothesize that functional deficiencies and hospitalization both independently predict large increases in CRN. We further
hypothesized that while Medicare, Medicaid and private insurance play a protective role for CRN, functional limitations and hospitalizations continue to have a large impact on medication adherence after controlling for insurance coverage.

MATERIALS AND METHODS

Data from the Health and Retirement Study (HRS) from 2010 was used for this study. The HRS is an ongoing longitudinal survey of a nationally representative sample of Americans age 50 and includes data concerning income, employment, health insurance, health care expenditures, cognitive function, and physical health. CRN was measured by asking participants, “Sometimes people delay taking medication or filling prescriptions because of the cost. At any time since the last interview or in the last two years have you ended up taking less medication than was prescribed for you because of the cost?” Participants could answer yes, no, refuse to answer, or say that they did not know. Respondents were also asked about limitations in Activities of Daily Living (ADLs), which include dressing, walking, bathing, eating, getting out of bed and toileting, and limitations in Instrumental Activities of Daily Living (IADLs), which include preparing meals, shopping, making phone calls and managing money [7-9]. They were also asked about the frequency of hospital admissions over the past 2 years. We first excluded 1,092 respondents who were younger than 50 years old, and then further excluded 51 respondents who refused to answer or said they did not know the answer to the question regarding CRN. This resulted in a final sample size of 20,776 adults.

We first performed bivariate analysis of CRN by age (divided into subgroups 50-64 years old and 65 years and older), gender, ethnicity, and type of insurance coverage (Medicare, Medicaid, Medicare-Medicaid dual eligibility, private insurance, no insurance) using chi-squared tests. We then performed statistical analysis on the variations in CRN by number of ADL deficiencies, number of IADL deficiencies, and the number of hospitalizations utilizing logit models with CRN as a binary outcome. We further performed multivariate analysis on variations in CRN by the number of ADL deficiencies, IADL deficiencies, and hospitalizations while controlling for age, gender, race, ethnicity and insurance coverage. All analyses were performed using the statistical program, Stata MP 13 [10].

RESULTS AND DISCUSSION

Table 1 reports respondent characteristics and their associated CRN. Of the respondents, 2,620 (12.6%) reported CRN. Respondents between 50 and 64 years old had a higher CRN rate than those 65 years or older (18.3% vs. 7.5%, p<0.001), while females had a higher CRN rate than males (14.4% vs. 10.3%, p<0.001). African-Americans reported CRN more frequently than whites (19.3% vs. 10.5%, p<0.001), while Hispanics reported CRN more frequently than non-Hispanics (18.2% vs.12.2%, p<0.001). Examining insurance type, respondents with private insurance had a lower CRN rate than those without private insurance (9.7% vs. 16.4%, p<0.001). Respondents with Medicare had a lower CRN rate than those without Medicare (9.8% vs. 16.1%, p<0.001), while those with Medicaid had a higher CRN rate than those without (17.3% vs. 12.1%, p<0.001). Respondents who lacked health insurance (public or private) had a higher rate of CRN than those with any type of health insurance (24.8% vs. 11.1%, p<0.001). Finally, those residing in a nursing home had a lower rate of CRN than those who did not (4% vs. 12.8%, p<0.001).

Examining functional limitations, CRN rates were significantly higher for respondents with one or more ADL limitations (p<0.001) and IADL limitations (p<0.001) compared to respondents without any of these limitations. Similar results were found for having one or more hospitalizations in the past two years (p<0.01). Overall, 29% of the respondents (N=6,016) had one or more functional deficiencies in either ADLs or IADLs, with a mean number of ADL deficiencies and IADL deficiencies of 2.5 (s.d. 1.6) and 1.9 (s.d. 1.1), respectively. Among the 20,776

<table>
<thead>
<tr>
<th>Number of hospitalizations</th>
<th>Respondents with no CRN: N (%)</th>
<th>Respondents with CRN: N (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No admissions</td>
<td>13,202 (72)</td>
<td>1,663 (63)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1 admission</td>
<td>2,867 (16)</td>
<td>482 (18)</td>
<td></td>
</tr>
<tr>
<td>2 admissions</td>
<td>1,114 (6)</td>
<td>217 (8)</td>
<td></td>
</tr>
<tr>
<td>3 or more admissions</td>
<td>943 (5)</td>
<td>258 (10)</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Characteristics of respondents with and without cost-related medication non-adherence.
respondents, 28% had one or more inpatient admissions, 12% had 2 or more admissions, and 6% had 3 or more admissions (data not shown).

Table 2 illustrates the adjusted and unadjusted odds ratios of CRN using multivariate logistic regression models with or without controlling for age, gender, race, ethnicity, insurance type, and nursing home residence. In adjusted analysis, respondents with 1, 2, and 3 or more ADL deficiencies were 83%, 110%, and 143%, more likely to report CRN than those without any ADL deficiency, respectively (p<0.001), while respondents with 1, 2, or 3 more IADL deficiencies were 57%, 62%, and 40%, more likely to report CRN than those without any IADL deficiencies, respectively (p<0.001). Respondents with 1, 2 and 3 or more hospitalizations were 47%, 62%, and 106% more likely to report CRN than those without any hospitalizations, respectively (p<0.001). The area under the ROC curve was 0.73 in the adjusted model, compared to 0.61 in the unadjusted model. Results for the multivariate logistic regression analysis, adjusted for age, gender, race and ethnicity, Medicare, Medicaid, dual eligibility, non-insurance, and nursing home residence. Omitted sub-groups for each category are the referent groups as noted by the table.

Our study provides some new insights into the impact of functional status and hospitalization on CRN. Although they are interrelated, limitations of ADLs and hospitalizations each independently predicted large increases in CRN among older Americans, even after adjusting for insurance coverage, including Medicare and Medicaid. The magnitude of impact increases as the number of ADL limitations and hospitalizations increase. This is important because it suggests that patients with a very high disease burden are not sufficiently protected by their insurance policies and/or their economic resources are limited that they reduce medical treatment. More research is much needed to understand and address the effect of insurance benefit design on medication adherence, morbidity, and mortality among the subgroup of patients with greater degrees of functional limitation and more frequent hospitalization. Because functional deficiencies and hospitalizations can strain the economic resources of patients through multiple pathways such as co-payments, costs of transportation, concurrent therapies, and other out-of-pocket expenses, solutions to eliminating CRN in sicker and older patients will likely require a multidisciplinary approach involving healthcare providers, insurance companies, social workers and patients.

Our study also suggests that although limitations of both ADLs and IADLs are associated with higher CRN rates in general, the incremental impact of ADL deficiencies is larger than that of IADL deficiencies. However, the fact that both ADL and IADL deficiencies independently predict CRN suggests that both deficiencies should be taken into account when evaluating the risk of CRN.

Our study has several important limitations. First, CRN and functional deficiencies were self-reported, allowing the presence of measurement error and recall bias. Second, we did not examine the specific disease burden or, more specifically, the number or types of medical conditions of the respondents. Third, our study uses only cross-sectional data from the HRS 2010 survey, and thus, conclusions on time-varying causal relationships cannot be established.

**CONCLUSION**

Overall, we presented some new insights into the impact of functional limitations and frequent hospitalization on CRN in older patients. The large increases in CRN that accompany these factors highlight the improvements needed in insurance design and healthcare policies for the sicker and older population. Finding solutions to decrease CRN among this population, a population who already consume a large amount of medical resources is a significant step in reducing economic barriers to healthcare.

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