

## Research Article

# The Effect of Functional Limitations and Hospitalization on Out-of-Pocket Medical Payments in older Adults

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## Abstract

**Objective:** To evaluate the effect of functional limitations and hospitalization on out-of-pocket medical payments (OOPs) of community-dwelling adults 50 years or older using a nationally representative data set.

**Methods:** We utilized the 2010 data from the Health and Retirement Study (HRS). Americans 50 years or older were surveyed about their Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADLs), and hospital admissions over the past 2 years. OOPs were assessed by self-report over the last 2-year period. Bivariate analyses of the association between OOPs and socio-demographic factors, ADLs/IADLs and hospitalizations were first performed. Then, a general linear regression analysis was conducted to assess the relationship between OOPs, functional limitations and number of hospitalizations after controlling for socio-demographic variables. We further conducted a generalized linear model to ascertain the statistical significance of these variables.

**Results:** 5,614 (27.3%) out of 20,585 older adults had one or more functional limitations in either ADLs or IADLs. Among the 20,585 respondents, 27% had one or more inpatient admissions. The mean OOPs were \$2,497, with the 25th and 75th percentile at \$150 and \$2,730, respectively. After controlling for insurance type and socio-demographic factors, our general linear regression analysis demonstrated that those with 3 or more ADL limitations had \$1,165 more in OOPs compared to those without any limitations, while respondents with 3 or more inpatient admissions had \$3,193 more in OOPs compared to those who were never hospitalized. These findings remained statistically significant in the generalized linear model analysis.

**Conclusion/implication:** Limitations of ADLs and hospitalizations both independently predicted large increases in OOPs among community-dwelling older adults even after adjusting for insurance coverage. This highlights the need to understand and address OOPs of care among the older population with functional limitations and hospitalizations.

## ABBREVIATION

OOPs: Out-of-pocket medical payments

## INTRODUCTION

Functional limitations and hospitalization are known to be associated with poor outcomes among older persons. Functional limitation is defined as a limitation in Activities of Daily Living (ADLs) which are self-care tasks including dressing, bathing and

showing, ambulating, self-feeding, grooming, and toileting, or in Instrumental Activities of Daily Living (IADLs) which are tasks that support an independent lifestyle such as housework, shopping, managing money, taking medications, utilizing the telephone, or being able to utilize transportation. Adults with functional limitations tend to have higher healthcare expenses than individuals with no limitations [1]. Functional limitation has also been identified as one of the strongest predictors of institutionalization in a nursing home for community-dwelling

adults [2]. When studying the consequences of hospitalization, previous studies have found that patients with frequent hospital admissions generated a disproportionately larger share of hospital visits and healthcare costs [3-5].

What is less known are the effects of functional deficiencies and hospitalizations on patients' medical out-of-pocket payments (OOPs) despite insurance coverage? Recent research indicate that OOPs in the United States totaled \$306.2 billion in 2010 and represented 11.8 percent of total national health expenditures, [6] with 1 in 3 Americans reporting having difficulty paying their medical bill [7]. Furthermore, adults with multiple chronic conditions are more likely to pay OOPs exceeding 5 percent of their income for two consecutive years compared to patients with a single chronic condition or no chronic conditions [9]. Such consequence is important to practitioners, policymakers, as well as patients; because OOPs strain the already scarce economic resources patients have due to the higher likelihood of non-employment or retirement in older age. These financial pressures may eventually lead to poor adherence to medical therapies and care.

In this study, we aim to assess the effects of functional limitations and the number of hospitalizations on OOPs, using a nationally representative sample of community-dwelling adults 50 years or older. We hypothesize that functional limitations and hospitalization each independently predict large increases in OOPs for older adults as these patients often have more healthcare needs. We further hypothesize that while Medicare, Medicaid and private insurance play a protective role for OOPs, both functional limitations and hospitalizations still play a significant role in increasing patients' OOPs even after controlling for insurance coverage.

## MATERIALS AND METHODS

The 2010 data from the Health and Retirement Study (HRS) was utilized for this study. The HRS is an ongoing longitudinal cross-sectional survey of a nationally representative sample of Americans over the age of 50 and includes data about income, employment, health insurance, health care expenditures, cognitive functioning, and physical health. Respondents were specifically asked about their deficiencies in Activities of Daily Living (ADLs) which include dressing, walking, bathing, eating getting out of bed and toileting, Instrumental Activities of Daily Living (IADLs) which include preparing meals, shopping, making phone calls and managing money [9-11], and frequency of hospitalization over the past 2 years. Out-of-pocket medical payments were measured based upon self-report - respondents were asked about their OOPs for hospitalizations, clinic visits, nursing homes, prescription drugs, outpatient surgeries, dental services, home health services, and all other medical expenses over the two-year period.

In our study, we included all respondents in the HRS 2010 study who were 50 years or older with the exception of those who were currently institutionalized in a nursing home. This resulted in a final sample size of 20,585 adults.

We first performed bivariate analysis of OOPs 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 two-sample two-tailed t-tests. We then performed statistical analysis on the variations in OOPs by race, number of ADL deficiencies, number of IADL deficiencies, and the number of hospitalizations utilizing general linear models. Multivariate analysis on variations in OOPs by the number of ADL limitations, IADL limitations, and hospitalizations while controlling for age, gender, race, ethnicity and insurance coverage were then conducted using general linear regression models. Lastly, to further ascertain the statistical significance of the aforementioned variables, we conducted a multivariate regression analysis using generalized linear model with the same set of dependent and independent variables but with gamma distribution and log link function to address the skewness of distribution in OOPs [12]. All analyses were performed using the statistical program, Stata MP 13 [13].

## RESULTS AND DISCUSSION

Table 1 illustrates respondent characteristics and their associated OOPs. The mean OOPs for the entire sample were \$2,497, with the 25th and 75th percentile at \$150 and \$2,730 respectively. African-Americans had lower OOPs than whites ( $p < 0.001$ ), while Hispanics had lower OOPs than non-Hispanics ( $p < 0.001$ ). In regards to insurance coverage, those with Medicaid, and those who were dual-eligible, had lower OOP. Respondents with private insurance, however, had higher OOPs than those without private insurance. Finally, those without any health insurance (public or private) has lower OOPs than those with any health insurance ( $p < 0.001$ , respectively). When examining functional deficiencies, respondents with one or more ADL deficiencies had higher OOPs than those without any deficiency. Similar results were found with any deficiencies of IADLs and having one or more hospitalizations in the past two years ( $p < 0.05$ ). Overall, 5,614 (27.3%) out of 20,585 older adults had one or more functional deficiencies in either ADLs or IADLs, with mean ADL deficiencies of 2.2 (s.d. 1.5) and mean IADL deficiencies of 1.8 (s.d. 1.0). Among the 20,585 respondents, 27% had one or more inpatient admissions, 11% had 2 or more, and 5% had 3 or more admissions (data not shown).

Figure 1 illustrates the incremental OOPs using multivariate general linear models when controlling for insurance status including Medicare, Medicaid, dual eligibility, no insurance coverage, age, gender, race, and ethnicity. We found that compared to those without any ADL deficiencies, patients with 3 or more ADL deficiencies had \$1,165 more in OOPs ( $p < 0.001$ ), while respondents with 3 or more hospitalizations had \$3,193 more in OOPs ( $p < 0.001$ ) compared to those who were never hospitalized in the last two years.

In the generalized linear model with gamma distribution and log link function, patients with 3 or more ADL limitations continued to have significantly higher OOPs (coefficient estimate 0.26,  $p < 0.001$ ), as well as those with 3 or more hospitalizations (coefficient estimate 0.89,  $p < 0.001$ ) (data not shown).

Our study provides some new insights into the financial consequences of functional limitations and frequent hospitalizations for patients. Although they are interrelated, limitations of ADLs and hospitalizations each independently

**Table 1:** Respondent Characteristics and Out-of-pocket Medical Payments.

	N (%)	OOPs Mean \$ (25%ile, 75%ile)	P-value
Age: full sample	20,585 (100)	2,497 (150,2,730)	
50-64	10,020 (49)	2,383 (280, 2,730)	0.19
65 or older	10,565 (51)	2,503 (320, 2,840)	
Gender: Male	8,868 (43)	2,376 (162, 2,720)	0.21
Female	11,717 (57)	2,486 (240, 2,820)	
Race: White	15,182 (74)	2,618 (336, 3,060)	referent
African American	4,001 (19)	1,782 (600, 2,040)	<0.001
Other	1,402 (7)	2,368 (0, 2,000)	0.15
Ethnicity: Hispanic	1,549 (8)	1,873 (0, 1,923)	<0.001
Non-Hispanic	19,036 (92)	2,485 (240, 2,873)	
Insurance status			
Medicare	11,071 (54)	2,460 (282,2,900)	0.60
Non-Medicare	9,514 (46)	2,414 (140,2,690)	
Medicaid	1,849 (9)	985 (0, 840)	<0.001
Non-Medicaid	18,736 (91)	2,582 (296, 3,000)	
Dual	1,240 (6)	1,076 (0, 960)	<0.001
Non-dual	19,345 (94)	2,526 (245, 2,920)	
Private insurance	11,573 (56)	2,786 (420, 3,200)	<0.001
Non-private insurance	9,012 (44)	2,067 (0, 2,240)	
No insurance	2,462 (12)	1,927 (0, 1,803)	<0.001
Any type of insurance	18,123 (88)	2,508 (288, 2,920)	
ADL deficiencies			
0 deficiencies	16,818 (82)	2,291 (240, 2,700)	referent
1 deficiency	1,675 (8)	2,807 (120, 3,300)	0.001
2 deficiencies	856 (4)	2,914 (55, 3,428)	0.005
3 or more deficiencies	1,236 (6)	3,618 (0, 3,290)	<0.001
IADL deficiencies			
No deficiencies	16,551 (80)	2,311 (240, 2,726)	referent
1 deficiency	2,235 (11)	2,903 (135, 2,960)	0.03
2 deficiencies	927 (5)	2,787 (0, 3,200)	<0.001
3 or more deficiencies	872 (4)	3,302 (0, 3,364)	<0.001
Number of hospitalizations			
No admissions	14,974 (73)	1,979 (165, 2,400)	
1 admission	3,265 (16)	3,233 (480, 3,940)	0.03
2 admissions	1,276 (6)	3,619 (288, 4,280)	<0.001
3 or more admissions	1,070 (5)	5,038 (208, 5,200)	<0.001

predicted large increases in OOPs among older Americans, even after adjusting for insurance coverage including Medicare and Medicaid. This is important because adults who are unable to perform their ADLs or IADLs are less likely to be employed due to their disabilities and have lower income compared to adults without any disabilities [14]. These higher OOPs cause additional financial strain and may lead to non-adherence to medical care and therapies, thus perpetuating a vicious cycle of worsening health status due to noncompliance and financial hardship.

Our study also demonstrates that insurance coverage, particularly Medicaid and dual eligibility, are protective for OOPs. This emphasizes the need to ensure the adequacy of insurance coverage for older adults. However, it is troublesome that after controlling for insurance coverage, functional deficiencies and frequency of hospitalizations still have a large impact on OOPs.

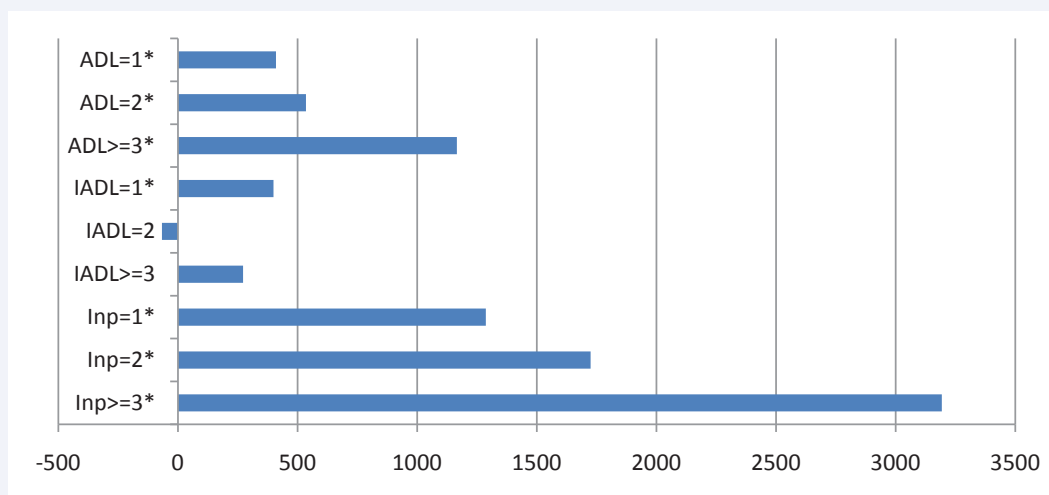
Our study also suggests that Hispanics and respondents lacking health insurance had lower OOPs. It is concerning if this means that the medical needs of adults in these subgroups are less likely to be met. Further research is much needed to investigate the causal factors of lower OOPs in these subgroups as this can highlight weaknesses in our current healthcare delivery system.

Our results are consistent with findings from previous literature in that patients with 3 or more ADL deficiencies are at the highest risk of institutionalization in a nursing home [15,16]. In addition, our findings warrant additional concern that financial burden for those patients are disproportionate and thus deserve more attention by practitioners and policymakers in our health care system. Addressing the burden of OOPs in these patients requires a combination of an improvement in healthcare policies and insurance benefit design to expand coverage for costly services and therapeutics. The settlement of a class-action lawsuit that ended the Medicare Improvement Standard is a welcome step toward continuous coverage for those patients with functional limitations that require physical and occupational therapy [17]. In addition, the institution of Medicare Part D outpatient drug program likely alleviates some of the burden of OOPs for the general Medicare population. It is unclear if the financial burdens specifically for patients who have functional limitations or who are frequently hospitalized have been reduced by these changes. Interventions to decrease future hospital admissions, particularly for patients who are frequently hospitalized are currently being studied by many research groups and if effective, may significantly lower OOPs and overall healthcare expenditures.

Our study has several important limitations. First, all the OOP measures are self-reported, allowing the presence of measurement error and recall bias. Second, we did not examine all of the economic resources available to community-dwelling older adults that could provide further insight into the full extent of the financial strain placed on patients by functional deficiencies and hospitalizations. 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 financial consequences of functional deficiencies and hospitalization



**Figure 1** Adjusted Incremental Amount of Out-of-Pocket Medical Payments.

\* $p < 0.05$  in general linear regression analysis, omitted group for ADL: ADL=0; IADL: IADL=0; inpatient admission: no inpatient admission; controlling for insurance status including Medicare, Medicaid, dual eligibility, no insurance, age, gender, race and ethnicity.

for patients. The large increases in OOPs that accompany these factors highlight the need to address out-of-pocket medical costs to fully recognize the financial burden of functional disability and hospitalization on older Americans. In order to reduce the OOPs for these patients, efforts must be made to prevent future hospital admissions in patients who are frequently hospitalized as well as to expand insurance coverage for the healthcare needs of patients with functional limitations.

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