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Association between Potentially Inappropriate Medication Prescribing and Health-related Quality of Life among U.S. Older Adults

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ABSTRACT

Introduction: Potentially inappropriate medications (PIMs) can negatively impact clinical outcomes among older adults. Their impact on health-related quality of life (HRQoL) among U.S. older adults is less well understood.
Hypothesis: We hypothesize that exposure to PIMs is negatively associated with HRQoL.
Study Design: Cross-sectional analysis utilizing U.S. nationally representative data from the 2011 to 2015 Medical Expenditure Panel Survey (MEPS).
Methods: Respondents aged ≥65 years were identified within MEPS from 2011-2015. PIM exposure was identified using the 2019 Beers criteria. Primary outcomes included the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores of the 12-Item Short Form Health Survey (SF-12). Mean PCS and MCS scores were compared with t-tests. Linear regression models were used to examine the association of PIM exposure on HRQoL after adjusting for covariates, with a stratification based on age groups. Survey weighted procedures were used throughout (SAS Version 9.4).
Results: Unadjusted analysis showed poorer scores in the PIM exposed group in terms of PCS [aged 65-74: 40.4 vs 46.1; aged 75-84: 38.1 vs 42.0; aged ≥85: 33.2 vs 37.0] and MCS [aged 65-74: 51.0 vs 54.0; aged 75-84: 51.0 vs 52.9; aged ≥85: 47.2 vs 51.3] scores (all p <.0001). In adjusted models, PIM exposure was associated with poorer PCS scores in respondents aged 65-74 years (adjusted regression coefficient: -1.23 [95% CI -1.82, -0.649; p <.0001]) and 75-84 years (adjusted regression coefficient: -1.03 [95% CI -1.89, -0.184; p =.0174]). PIM exposure was also associated with poorer MCS scores in respondents aged 65-74 years (adjusted regression coefficient: -1.60 [95% CI -2.10, -1.10; p <.0001]) and ≥85 years (adjusted regression coefficient: -2.73 [95% CI -3.97, -1.49; p <.0001]).
Conclusions: Our results suggest that patient's exposure to PIMs is associated with poorer HRQoL. Further work is needed to assess whether interventions to deprescribe PIMs may help to improve patient's HRQoL.

BACKGROUND

- The use of potentially inappropriate medication (PIMs) in older adults has been associated with increased healthcare utilization, increased costs, and variable impacts on health-related quality-of-life (HRQoL)
- The American Geriatric Society (AGS) Beers Criteria provides a list of PIMs which can be used as a tool to evaluate quality of care, cost, and patterns of drug use of older adults
- Understanding how PIM prescribing impact HRQoL can be important for the development of future interventions to address this problem

OBJECTIVES

- Determine the association between use of PIM and HRQoL based on the Physical Component Summary and Mental Component Summary scores of the Short-Form 12 health survey (SF-12)
- Determine if there is an association between number of PIMs prescribed and SF-12 components scores

METHODS

Study Design: Cross-sectional analysis

Data Source: 2011-2015 Medical Expenditure Panel Survey (MEPS) data – Prescribed Medicines (PM), Full-year Consolidated (FY), and Medical Conditions (MC) files

Study Sample: All adults aged ≥65 years

Primary Exposure:
- Any fill for a PIM listed in of the 2019 AGS Beers criteria
- A qualified definition of exposure was developed based on a previous approach reported by Davidoff et al. to consider dose, route and comorbidities as necessary for medications with specific exceptions or qualifications

METHODS

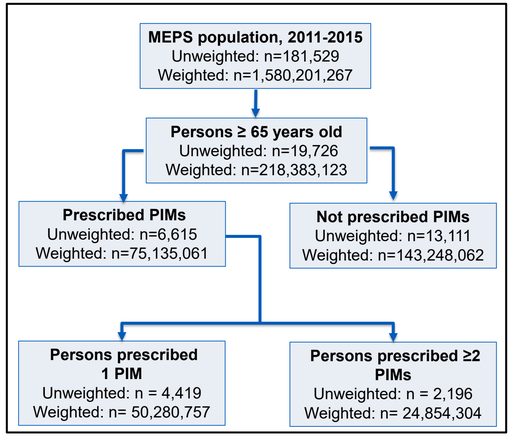
Outcomes:
- Physical Component Summary and Mental Component Summary: Scores were computed from the SF-12 to represent HRQoL

Covariates:
- Socio-demographics: Age, sex, race/ethnicity, marital status, education level, income, insurance coverage, ADL limitations, IADL limitations, census region
- Comorbidities: Coronary heart disease, angina, myocardial infarction, heart failure, chronic renal failure, cancer, arthritis, hypertension, dyslipidemia, asthma, stroke, emphysema, chronic bronchitis, diabetes, dementia

Statistical Analysis:
- Baseline demographics and comorbidities were compared between those with and without PIM using the chi-squared test
- Participants were stratified into three age groups: 65-74 years, 75-84 years, and ≥85 years of age
- Mean PCS and MCS scores were compared with a t-test between those on no PIMs and ≥1 PIM
- Serial t-tests with a Bonferroni correction to adjust for multiple comparisons between those on 0 PIM, 1 PIM, and ≥2 PIMs
- Linear regression models were used to describe the association between PIM exposure and HRQoL scores
- Survey weighted procedures were used, when possible, to produce national estimates and account for the complex survey design
- All statistical tests were 2-tailed with a level of significance set at P<0.05
- SAS version 9.4 was used for the analysis

RESULTS

Figure 1. Cohort Assembly



RESULTS

Table 1. Baseline demographics between PIM and Non-PIM users

Characteristic	All (n=19,726)	SE	No PIM (n=13,111)	SE	PIM (n=6,615)	SE	P-value
Age							**0.0265**
65-74	56.9	0.81	57.8	0.88	55.3	1.05	
75-84	30.9	0.66	29.9	0.76	32.7	0.87	
≥85	12.2	0.55	12.3	0.60	12.0	0.75	
Sex							**0.0046**
Female	55.9	0.48	54.8	0.88	58.1	0.94	
Race/Ethnicity							**0.0007**
Hispanic	7.65	0.52	7.85	0.55	7.26	0.57	
White (Non-Hispanic)	77.8	1.04	76.8	1.15	79.9	1.01	
Black (Non-Hispanic)	8.66	0.54	9.14	0.57	7.75	0.60	
Insurance							**<.0001**
Medicare only	36.0	0.77	36.4	0.86	35.2	1.00	
Medicare and private	52.1	0.87	52.2	0.96	52.0	1.06	
Medicare and public	10.8	0.53	10.0	0.49	12.3	0.77	
No Medicare/uninsured	1.12	0.13	1.39	0.16	0.60	0.12	
Comorbidities							
Coronary heart disease	19.5	0.47	17.1	0.55	23.9	0.87	**<.0001**
Myocardial Infarction	12.3	0.40	10.8	0.42	15.0	0.72	**<.0001**
Dyslipidemia	62.5	0.62	59.6	0.75	68.1	0.98	**<.0001**
Diabetes	22.4	0.52	18.3	0.56	30.1	0.93	**<.0001**
Cancer	30.9	0.72	29.2	0.83	34.1	0.95	**<.0001**
Hypertension	68.8	0.59	65.7	0.71	74.6	0.88	**<.0001**
Asthma	8.72	0.33	7.71	0.33	10.6	0.63	**<.0001**
Stroke	12.3	0.35	10.7	0.40	15.4	0.61	**<.0001**
Emphysema	6.44	0.33	5.48	0.34	8.27	0.50	**<.0001**
Chronic Bronchitis	4.42	0.22	3.75	0.24	5.71	0.38	**<.0001**

Abbreviations: SE, standard error; PIM, potentially inappropriate medication

Table 2. Mean SF-12v2 HRQoL Scores based on PIM Exposure

Physical Component Summary (PCS) of SF-12

Age	No PIM exposure	PIM exposure	t-value	P-value
65-74	46.1	40.4	14.57	**<.0001**
75-84	42.0	38.1	7.81	**<.0001**
≥85	37.0	33.2	4.98	**<.0001**

Mental Component Summary (MCS) of SF-12

Age	No PIM exposure	PIM exposure	t-value	P-value
65-74	54.0	51.0	10.29	**<.0001**
75-84	52.9	51.1	4.39	**<.0001**
≥85	51.3	47.2	6.75	**<.0001**

Physical Component Summary (PCS) of SF-12

Age	0 PIM	1 PIM	≥2 PIMs	P-values (0 vs 1; 0 vs ≥2; 1 vs ≥2)		
65-74	46.1	41.5	38.2	**<.0001**	**<.0001**	**<.0001**
75-84	42.0	39.0	36.3	**<.0001**	**<.0001**	**0.002**
≥85	36.96	34.2	30.9	**0.0005**	**<.0001**	**0.006**

Mental Component Summary (MCS) of SF-12

Age	0 PIM	1 PIM	≥2 PIMs	P-values (0 vs 1; 0 vs ≥2; 1 vs ≥2)		
65-74	54.0	51.7	49.7	**<.0001**	**<.0001**	**0.002**
75-84	52.9	51.6	49.9	**0.001**	**<.0001**	0.023
≥85	51.3	41.4	46.6	**<.0001**	**<.0001**	0.512

Table 4. Association Between PIM exposure and HRQoL Scores

Physical Component Summary (PCS) of SF-12

Age	Unadjusted Coefficient (95%CI)	P-value	Adjusted Coefficient (95%CI)	P-value
65-74	-5.68 (-6.45, -4.91)	**<.0001**	-1.23 (-1.82, -0.65)	**<.0001**
75-84	-3.91 (-4.89, -2.92)	**<.0001**	-1.03 (-1.89, -0.18)	**0.0174**
≥85	-3.77 (-5.25, -2.28)	**<.0001**	-0.841 (-2.11. 0.43)	0.1936

Mental Component Summary (MCS) of SF-12

Age	Unadjusted Coefficient (95%CI)	P-value	Adjusted Coefficient (95%CI)	P-value
65-74	-2.99 (-3.57, -2.41)	**<.0001**	-1.60 (-2.10, -1.10)	**<.0001**
75-84	-1.89 (-2.73, -1.04)	**<.0001**	-0.748 (-1.57, 0.08)	0.0754
≥85	-4.15 (-5.36, -2.94)	**<.0001**	-2.73 (-3.97, -1.49)	**<.0001**

Abbreviations: CI, confidence interval, SF-12, Short-Form 12
Adjusted model controlled for: sex, race, marital status, education, income, insurance coverage, self reported general and mental health status, ADL limitations, IADL limitations, geographic region, coronary artery disease, angina, myocardial infarction, heart failure, chronic renal failure, cancer, arthritis, hypertension, dyslipidemia, asthma, stroke, emphysema, chronic bronchitis, diabetes, dementia, and polypharmacy

Table 5. Association Between Number of PIMs and HRQoL Scores

Physical Component Summary (PCS) of SF-12

Age	Unadjusted Coefficient (95%CI)	P-value	Adjusted Coefficient (95%CI)	P-value
65-74				
1	-4.56 (-5.38, -3.73)	**<.0001**	-0.93 (-1.57, -0.30)	**0.0042**
≥2	-7.88 (-9.07, -6.68)	**<.0001**	-1.89 (-2.78, -1.01)	**<.0001**
75-84				
1	-3.02 (-4.03, -2.01)	**<.0001**	-0.66 (-1.57, 0.25)	0.1547
≥2	-5.69 (-7.37, -4.01)	**<.0001**	-1.85 (-3.14, -0.55)	**0.0053**
≥85				
1	-2.79 (-4.33, -1.25)	**0.0005**	-0.56 (-1.92, 0.80)	0.4165
≥2	-6.07 (-8.32, -3.82)	**<.0001**	-1.60 (-3.75, 0.55)	0.1429

Mental Component Summary (MCS) of SF-12

Age	Unadjusted Coefficient (95%CI)	P-value	Adjusted Coefficient (95%CI)	P-value
65-74				
1	-2.31 (-2.91, -1.70)	**<.0001**	-1.32 (-1.87, -0.77)	**<.0001**
≥2	-4.33 (-5.45, -3.20)	**<.0001**	-2.22 (-3.16, -1.28)	**<.0001**
75-84				
1	-1.32 (-2.34, -0.31)	**0.0110**	-0.41 (-1.38, 0.56)	0.3963
≥2	-3.02 (-4.27, -1.77)	**<.0001**	-1.48 (-2.56, -0.40)	**0.0076**
≥85				
1	-3.91 (-5.41, -2.41)	**<.0001**	-2.79 (-4.24, -1.35)	**0.0002**
≥2	-4.70 (-6.59, -2.82)	**<.0001**	-2.56 (-4.43, -0.70)	**0.0072**

Abbreviations: CI, confidence interval
Adjusted model controlled for: sex, race, marital status, education, income, insurance coverage, self reported general and mental health status, ADL limitations, IADL limitations, geographic region, coronary artery disease, angina, myocardial infarction, heart failure, chronic renal failure, cancer, arthritis, hypertension, dyslipidemia, asthma, stroke, emphysema, chronic bronchitis, diabetes, dementia, and polypharmacy
Reference: 0 PIMs

CONCLUSIONS

- The use of potentially inappropriate medication (PIMs) in older adults, after adjusting for confounders, is associated with poorer HRQoL.
- Among older adults who were prescribed PIMs, exposure to more than one PIM was generally associated with poorer HRQoL.
- Further work is needed to assess whether interventions to deprescribe PIMs may help to improve patient's quality of life.