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Factors associated with inappropriate prescribing among older adults with complex care needs who have undergone the interRAI assessment

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Abstract:

Abstract

Aim To identify factors associated with prescribing potentially inappropriate medications (PIMs) in older adults (≥ 65 years) with complex care needs, who have undertaken a comprehensive geriatric risk assessment. **Methods:** A nationwide cross-sectional (retrospective, observational) study was performed. The national interRAI Home Care assessments conducted in New Zealand in 2015 for older adults were linked to the national pharmaceutical prescribing data (PHARMS). The 2015 Beers criteria were applied to the cross-matched data to identify the prevalence of PIMs. The factors influencing PIMs were analysed using a multinomial logistic regression model. **Results:** 16,568 older adults were included in this study. Individuals diagnosed with cancer, dementia, insomnia, depression, anxiety, and who were hospitalized in the last 90 days, were more likely to be prescribed PIMs than those who were not diagnosed with the above disorders, and who were not hospitalized in the last 90 days. Individuals over 75 years of age, the Māori ethnic group among other ethnicities, individuals who were diagnosed with certain clinical conditions (diabetes, chronic obstructive pulmonary disease, stroke, or congestive cardiac failure), individuals requiring assistance with activities of daily living and better self-reported health, were associated with a lesser likelihood of being prescribed PIMs. **Conclusion:** The study emphasizes the identification of factors associated with the prescription of PIMs during the first completed comprehensive geriatric assessment. Targeted strategies to reduce modifiable factors associated with the prescription of PIMs in subsequent assessments has the potential to improve medication management in older adults.

Key words: Geriatric Assessment, Home Care Services, Logistic models, New Zealand, Potentially Inappropriate Medication List, Risk Assessment.

1. Introduction:

Optimal use of numerous medications in the geriatric population is often debated and difficult to achieve, and there is a high prevalence of inappropriate medication use.[1] Several characteristics of ageing (alterations in pharmacokinetics and pharmacodynamics, frailty, geriatric syndromes, increased number of medications, multiple concomitant illnesses) influence prescribing for older adults.[2]

Identifying potentially inappropriate medications (PIMs) by the application of criterion-based explicit screening tools is the most common method[3], of which the Beers Criteria are commonly used to assess inappropriate prescribing of medications in older adults.[4] Pharmacopeidemiological studies conducted in New Zealand (NZ) have reported the prevalence of PIMs in community-dwelling older people and for individuals living in residential aged-care facilities as 42.7% and 40.9% respectively.[5, 6] Several studies have focussed on the predictors of PIMs in older adults in various settings; however, the evidence for factors influencing the prescription of PIMs in home based older adults with complex care needs is limited.[7] Consequent to the higher prevalence of PIMs in older adults in NZ, it is important to identify factors associated with the prescription of PIMs, and to better target interventions to reduce their occurrence.[8]

Comprehensive geriatric risk assessment in home care using the interRAI-HC (International Resident Assessment Instrument-Home care) tool has been mandated in NZ since 2015 for all community-care older adults, and they contain information on multiple domains.[9]

The primary aim of the study is to identify factors associated with the prescription of PIMs in older adults who have undertaken a comprehensive geriatric risk assessment.

2. Methods:

We obtained the approval of the institutional review board: Ethical approval number 15/CEN/45/AM02.

2.1 Data source: The retrospectively conducted cross-sectional study utilized the comprehensive geriatric assessment, interRAI-HC (International Resident Assessment Instrument-Home Care)-PHARMS (Pharmaceutical Claims Data Mart) matched dataset for extracting anonymous data of all older individuals aged 65 years and above who were dispensed at least one prescription medication between January to October 2015. The data source is described previously elsewhere.[10] For this study, where an individual had undertaken multiple geriatric risk assessments in 2015, we only utilized the first comprehensive geriatric risk assessment.

The PHARMS extract files for 2015 furnished information pertaining to the prescription claims prepared by community pharmacists and funded by PHARMAC (Pharmaceutical management agency).

2.2 Study population: 16,568 community-dwelling individuals, aged 65 years and older, living in NZ, who have undertaken the first comprehensive geriatric risk assessment, and have received one or more prescription medications in 2015 were included.

2.3 PIMs exposure: The individuals who were prescribed at least one inappropriate medication in 2015, according to the 2015 Beers criteria [11] were classified as those prescribed PIMs.

2.4 Covariates: A scoping literature review was performed to determine the most common factors influencing the prescribing of PIMs in older adults. The individuals were categorised in four age groups of 65-74 years, 75-84 years, 85-94 years, and over 95 years. Data analysis was performed for all ethnicities with specific emphasis for NZ Europeans and Māori, as they are in majority in NZ.[5]

Based on the scoping literature, a number of explanatory variables were tested for their influence on prescribing patterns of PIMs, and these included:

A. **Sociodemographic:** Age, sex, ethnicity, marital status, alcohol intake, smoking, living arrangements, number of medications.

B. **Clinical:** Activities of daily living, self-reported health, hospitalization, dementia, insomnia, depression, anxiety, hemiplegia, Parkinson's disease, stroke, coronary heart disease (CHD), congestive cardiac failure (CCF), diabetes, chronic obstructive pulmonary disease (COPD), bowel incontinence, urinary incontinence, urinary tract infection, falls, fracture, cancer. Although the Beers criteria 2015 excludes patients requiring palliative care, we have included cancer as a risk factor associated with PIMs.

2.5 Statistical analysis:

STrengthing the Reporting of Observational studies in Epidemiology (STROBE) guidelines (www.strobe-statement.org) was used to report all analyses conducted for this study (**Appendix I)**. A multinomial logistic regression model was used to measure the relationship between PIMs use and all explanatory variables. 1-2 PIMs and more than equal to three ($\geq$3) PIMs were the outcome variables. Individuals not prescribed PIMs (nil PIMs) formed the reference group. Individuals with a diagnosis of any of the clinical ailments mentioned above were flagged as a binary variable; those with the diseased condition were coded as 1, the coding for no ailments was 0. The explanatory variables were tested for multi-collinearity. Model assumptions were tested using the Hosmer-Lemeshow goodness-of-fit test. All descriptive statistics were conducted using IBM SPSS version 24. Multinomial regression analysis was performed using StataCorp® Release 14.2.

3. Results:

InterRAI-HC information and prescription use data for 16,568 individuals aged 65 years and older were extracted; of these, females constituted 60.1% (9,964). The mean age of the individuals was 82.35 (±7.6) years. **Table 1** illustrates the sociodemographic variables of the population studied, and **Table 2** displays the associations of PIMs with the investigated variables according to the corresponding 95% confidence interval (CI) ($p<0.05$). We have independently considered the associations of 1-2 PIMs and $\geq$ 3 PIMs for each individual.

3.1 Sociodemographic factors:

Males were prescribed a slightly higher number of PIMs than the females (~43.1% for 1-2 PIMs and ~48% for three or more PIMs); individuals over 75 years of age were less likely to be prescribed PIMs (35.6% for 1-2 PIMs and 57.7% for $\geq$3 PIMs), compared to individuals aged 65-75

years, and the Māori ethnic group were less likely to be prescribed PIMs (47.5% for 1-2 PIMs, 41.3% for ≥3 PIMs) compared to the NZ Europeans (43.1% for 1-2 PIMs and 48.9% for ≥3 PIMs). Also, individuals who were prescribed a greater number of medications were more likely to be prescribed PIMs [aOR (Adjusted Odds Ratio) =1.12, CI=1.11, 1.13 for 1-2 PIMs, and aOR=1.22, CI=1.21, 1.23 for ≥3 PIMs), compared to individuals prescribed a single medication.

3.2 Clinical factors associated with 1-2 PIMs:

With respect to the activities of daily living, the individuals who were being supervised (aOR=0.82, CI=0.68, 0.98), who required extensive care (help throughout task, but performed 50% or more of the task on their own) (aOR=0.74, CI=0.56, 0.97), and who required maximal care (help throughout task, but performed less than 50% of task on their own) (aOR=0.67, CI=0.47, 0.95), were less likely to be prescribed 1-2 PIMs, compared to individuals who were independent in their self-performance and capacity. Individuals who reported good self-health (aOR=0.74, CI=0.56, 0.98) were less likely to be prescribed 1-2 PIMs compared to individuals who reported poor self-health. Individuals diagnosed with diabetes (aOR=0.75, CI=0.63, 0.89) were less likely to be prescribed 1-2 PIMs compared to individuals not diagnosed with diabetes. Individuals diagnosed with insomnia (aOR=1.44, CI=1.23, 1.69) were more likely to be prescribed 1-2 PIMs, compared to the individuals not diagnosed with insomnia. Individuals who were diagnosed with stroke (aOR=0.69, CI=0.58, 0.52) or COPD (aOR=0.79, CI=0.65, 0.96) had a lesser likelihood of being prescribed 1-2 PIMs, compared to the individuals who were not diagnosed with either of the diseases.

3.3 Clinical factors associated with ≥3 PIMs:

Individuals who reported excellent (aOR= 0.62, CI=0.41, 0.93) and good self-health (aOR=0.63, CI=0.47, 0.85) were less likely to be prescribed ≥3 PIMs compared to individuals who reported poor self-health. Individuals who were hospitalized in the last 90 days (aOR= 1.19, CI=0.47, 0.85) were more likely to be prescribed ≥3 PIMs, compared to individuals who had not undergone hospitalization in the last 90 days. Individuals diagnosed with cancer (aOR=1.35, CI=1.11, 1.66) were more likely to be prescribed ≥3 PIMs, compared to individuals with no diagnosis of cancer. Individuals with the diagnosis of diabetes (aOR=0.65, CI=0.54, 0.77) had a lesser likelihood of being prescribed ≥3 PIMs, compared to individuals not diagnosed with diabetes. Individuals diagnosed with dementia (aOR=1.26, CI=1.05, 1.51) were more likely to be prescribed ≥3 PIMs, compared to individuals not diagnosed with dementia. Individuals with the diagnosis of insomnia (aOR=1.80, CI=1.53, 2.11) had a greater likelihood of being prescribed ≥3 PIMs, compared to individuals not diagnosed with insomnia. Individuals diagnosed with anxiety (aOR=1.77, CI=1.32, 2.36) and depression (aOR=1.68, CI=1.28, 2.19) had a higher odds of being prescribed ≥3 PIMs compared to individuals who were not diagnosed with either of the conditions. Individuals diagnosed with CCF (aOR=0.76, CI= 0.62, 0.93) were less likely to be prescribed ≥3 PIMs, compared to individuals not diagnosed with CCF. Similarly, individuals diagnosed with stroke (aOR=0.56, CI=0.47, 0.67) or COPD (aOR=0.51, CI=0.41, 0.63) were less likely to be prescribed ≥3 PIMs compared to individuals not diagnosed with either of the 2 ailments.

4. Discussion:

The present study identified the factors associated with prescribing PIMs in the older adults of NZ who have undertaken a comprehensive geriatric risk assessment.[10] Several important sociodemographic and clinical factors predicted the use of PIMs in this population.

4.1 Sociodemographic factors of PIMs:

The current study demonstrates the significant independent relationship between prescription of PIMs and the male gender, the youngest group of older adults (age group 65-75 years), NZ Eurpoeans, and the prescription of a greater number of medications to each patient, after adjusting for several important confounders. The higher likelihood of prescribing PIMs in the age group of 65-74 years is similar to the findings of a study conducted by Willcox et al in 6,171 community-dwelling older adults. In their study, increasing age was associated with a lesser likelihood of being prescribed PIMs.[12] The findings may reflect better attention to patient safety concerns and avoidance of PIMs in increasingly older individuals.[8] Our study found an increased prescription of PIMs in NZ Europeans compared to the Māori population.[10] This could be attributed to the fact that the Māori group receives lesser prescriptions compared to the non-Māori population.[13] It has conclusively been shown that prescription of a higher number of medications increases the risk of PIMs.[14] Patients who are prescribed multiple medications are more likely to have multiple comorbid conditions, treatment under multiple physicians, recent hospitalizations, which explain all reasons why PIMs may be prescribed.[14]

4.2 Clinical factors of PIMS:

Our study reported a significant relationship between poor self-health and the prescription of PIMs, akin to the observation made by Howard et al [15] in a clinical trial of 889 community dwelling elderly patients recruited from randomly selected family practices in Ontario. A study conducted by Hanlon et al in frail veteran older adults showed that poor self-rated health was a significant determinant of PIMs use.[16]

Individuals hospitalized during the assessment or in the past 90 days were prescribed a higher number of PIMs. The results are analogous to the findings of a longitudinal cohort Swedish National Study on Aging and Care (SNAC).[17] In the SNAC study, individuals over 60 years of age in certain age groups were recruited from the Swedish national population, and examined. The findings are also consistent with a recent study conducted in community-dwelling elderly population in NZ, in which the number of prescription medications increased considerably after hospital admission in the past 12 months.[18] Hospitalization is a setting in which older adults are likely to be exposed to PIMs.[19] The impact of hospitalisation on PIMs use has been investigated in a study conducted by Hale LD et al [20], and was found to be significantly higher after hospital admissions.

Our analysis revealed that individuals diagnosed with insomnia, dementia, anxiety, depression, and cancer had an increased likelihood for prescription of PIMs. The observations of a cross-sectional study based on annual outpatient claims data in elderly outpatients in Taiwan correlate the high prevalence of prescription of PIMs in patients diagnosed with insomnia.[21] With ageing, a greater number of older adults are diagnosed with insomnia; and hence psychoactive medications are more frequently prescribed to older adults by physicians, thereby culminating to the prescription of PIMs.[22] Extavour et al have demonstrated the association of a clinical diagnosis of dementia to prescribing of inappropriate psychotropic medications, while assessing

medications for older community-dwelling adults in the USA.[23] A community-based cross-sectional study in Lebanon utilizing the 2012 Beers criteria supports the finding of a higher association of PIMs with dementia, in patients aged 65 years and over.[24] Findings from the SNAC study also point towards a high prevalence of PIMs in the population diagnosed with dementia.[17] Suboptimal prescribing can lead to considerable morbidity, especially in older patients with dementia, who may be more vulnerable to adverse events.[25]

Our study reported that individuals with a diagnosis of cancer were prescribed a greater number of PIMs than individuals not diagnosed with cancer. Similar findings are echoed in a retrospective cross-sectional study conducted in the USA, analysing PIMs in veterans residing in community living centres whereby a strong relationship between cancer and PIMs were reported.[26] PIMs warrant substantial interest and concern for prescribing in cancer patients because of the perils associated, which include increased risk of falls and/or fractures, cognitive impairment, and delirium, all of which can lead to compromised cancer management plans (e.g. treatment delays and/or premature treatment discontinuation).[27]

In our study we observed that the prevalence of PIMs was lower in individuals who were being supervised, who required maximal or extensive care, than in individuals with functional independence, contrary to the observations reported by a study conducted by Miller et al in community-dwelling older adults in USA utilizing the 2012 Beers criteria, who examined the determinants of prescription of PIMs by estimating the multivariate models of the relationship between PIMs use and a broad range of socioeconomic and health characteristics in a nationally representative sample of USA civilian, noninstitutionalized population of older adults.[8] The findings of our study portray that individuals with a functional dependence had better patient safety concerns and avoidance of PIMs with respect to ADL. We investigated that individuals diagnosed with COPD, stroke, or CCF, had a lower prevalence of PIMs prescribed, compared to those not diagnosed with these diseases. CCF and COPD were associated with PIM s use in other studies conducted globally in hospitalized elderly and elderly surgical patients.[28]

The factors influencing PIMs vary among different studies because of different research designs, several versions of the Beers criteria, and different criteria applied, dissimilar prescribing guidelines in different countries, and differing study population characteristics and settings (outpatient, continuing care, residential).

4.3 Strength of the study:

A nationwide database was used to identify the associations of PIMs in the geriatric population of NZ. The selection bias is overlooked due to the wide prescription coverage in this population. A standardized interRAI HC assessment conducted by trained healthcare professionals has the advantage of providing valid clinical, social and functional information. Several determinants included in the multivariate regression model such as self-reported health, living status, and cognition, are rarely available in studies that used the administrative claims data; hence, this study provides a unique perspective to the factors associated with PIMs use in the geriatric population. The long-term implications of this study have the potential to impact prescribing in the older population of NZ, and help in developing an appropriate tool for prescribing.

4.4 Limitations:

Some of the medications listed in the Beers criteria were not available in NZ or not funded by PHARMAC **(Appendix II)**. The findings of the study may not be generalised to other countries because of different health-care systems, prescribing guidelines, and treatment expenditures, as they influence prescribing patterns. The population studied is a high-risk population requiring complex care needs, unlike other study populations. Medications such as over-the-counter medications not captured by the prescription claims dataset may have underestimated the exposure to PIMs in this study population.

We couldn't assess the dispensing of antipsychotics for behavioural problems of dementia or for short-term use as an anti-emetic, and thus we excluded them from the analysis. The Beers criteria 2015 does not consider the prescription of antipsychotics for schizophrenia and bipolar disorders as PIMs, and hence, antipsychotic prescriptions for these conditions were excluded from the analyses. The interRAI assessment does not capture diagnoses of atrial fibrillation, hypogonadism, recently decompensated heart failure, removal of the pituitary gland, delirium, Barrett's esophagitis, gastroparesis, pathological hypersecretory condition, peptic ulcers, lower urinary tract symptoms, chronic kidney disease, benign prostatic hypertrophy, and hence, these diagnoses were excluded from the analyses. Hypertension is not diagnosed by the interRAI assessment; hence, the prescription for clonidine and peripheral alpha blockers as anti-hypertensive agents could not be confirmed. The information to identify specific conditions for prescriptions with oestrogens was unavailable.

5. Conclusion:

The present study found several sociodemographic and clinically relevant factors associated with PIMs use. Together with the results of our study, the published evidence demonstrates that the prescription of inappropriate medications to older people is influenced by a variety of factors, and although we highlight a greater number of medications and recent hospitalizations as a factor directly related to the prescription of PIMs, other important factors include functional status, reported self-health, the diagnosis of chronic obstructive pulmonary disease and congestive cardiac failiure. Identification of the modifiable determinants of PIMs, such as, number of medications isemphasised during the first completed comprehensive geriatric assessment. Targeted strategies to reduce modifiable determinants of PIMs in subsequent assessments has the potential to improve medication management in older adults.

Transparency

Declaration of funding

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Declaration of financial/other relationships

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Contribution statement

Study concept and design: Prasad Nishtala,
Acquisition of data: Prasad Nishtala, Sharmin Bala,
Analysis and interpretation of data: Sharmin Bala,

Drafting of the manuscript: Sharmin Bala, Hamish Jamieson.

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Table 1: Characteristics of the study population (N=16,568)

	Total	
	N	**(%)**
Age (years)		
65-74	3,048	(18.4)
75-84	6,776	(40.9)
85-94	6,192	(37.4)
95+	552	(3.3)
Sex †		
Female	9,964	(60.1)
Male	6,603	(39.9)
Ethnicity		
European	14,639	(88.4)
Māori	957	(5.8)
Other	972	(5.9)
Marital status		
Married	6,607	(39.9)
Other	9,961	(60.1)
Alcohol		
No	13,225	(79.8)
Yes	3,343	(20.2)
Smoking		
No	15,653	(94.5)
Yes	915	(5.5)
Living arrangements		
Alone	8,019	(48.4)
Spouse only	5,447	(32.9)
Other	1,292	(7.8)
With child ‡	1,810	(10.9)
Activities of daily living §		
Independent	9,985	(60.3)
Supervision	2,143	(12.9)
Limited	1,782	(10.8)
Extensive	1,046	(6.3)
Maximal	730	(4.4)
Dependent+	880	(5.3)
Self-reported health		
Poor	1925	(11.6)
Excellent	522	(3.2)
Good	6,806	(41.1)
Fair	5,695	(34.4)
Couldn't respond	1,620	(9.8)
Hospitalisation		

No hospitalisation||	8,602	(51.9)
Other	7,966	(48.1)
Cancer		
No	13,706	(82.7)
Yes	2,862	(17.3)
Dementia		
No	14,378	(86.8)
Yes	2,190	(13.2)
Insomnia		
No	11,795	(71.2)
Yes	4,773	(28.8)
Depression		
No	14,653	(88.4)
Yes	1,915	(11.6)
Bipolar		
No	16,404	(99.0)
Yes	164	(1.0)
Anxiety		
No	15,046	(90.8)
Yes	1,522	(9.2)
Schizophrenia		
No	16,441	(99.2)
Yes	127	(0.8)
Hemiplegia		
No	16,148	(97.5)
Yes	420	(2.5)
Parkinson's Disease		
No	16,014	(96.7)
Yes	554	(3.3)
Stroke		
No	13,895	(83.9)
Yes	2,673	(16.1)
Coronary heart disease		
No	11,670	(70.4)
Yes	4,898	(29.6)
Congestive-cardiac failure		
No	13,895	(83.9)
Yes	2,673	(16.1)
Diabetes		
No	13,154	(79.4)
Yes	3,414	(20.6)
COPD*		
No	13,929	(84.1)

Yes		2,639	(15.9)
Bowel Incontinence			
No	13,666		(82.5)
Yes	2,902		(17.5)
Urinary Incontinence **			
No	9,767		(59.0)
Yes	6,785		(41.0)
Urinary tract infection			
No	15,492		(93.5)
Yes	1,076		(6.5)
Falls			
No	9,693		(58.5)
Yes	6,875		(41.5)
Fracture ††			
No	15,830		(95.5)
Yes	734		(4,4)

†= 1 missing, **‡**= not spouse / partner, **§**=2 missing, **||,**= in last 90 days, *= Chronic Obstructive Pulmonary Disease, **=16 missing, †† =4 missing,

Table 2: Determinants of PIMs and confounding variables with odds ratio (OR) and 95% confidence intervals (CI), after multinomial regression (N=16,568)

	1-2 PIMs			≥ 3 PIMs		
	aOR	**95% CI**	***p*-value**	**aOR**	**95% CI**	***p*-value**
Age (years)						
65-74	1*	1*		1*	1*	
75-84	0.94	(0.78, 1.14)	0.557	0.69	(0.57, 0.85)	<0.001
85-94	0.76	(0.63, 0.94)	0.009	0.46	(0.37, 0.57)	<0.001
95+	0.66	(0.48, 0.93)	0.016	0.31	(0.21, 0.44)	<0.001
Sex †						
Female	1*	1*		1*	1*	
Male	1.3	(1.13, 1.49)	<0.001	1.36	(1.18, 1.57)	<0.001
Ethnicity						
European	1*	1*		1*	1*	
Māori	0.76	(0.59, 0.98)	0.035	0.50	(0.38, 0.65)	<0.001
Other	0.81	(0.64, 1.05)	0.118	0.63	(0.48, 0.82)	0.001
Marital status						
Married	1*	1*		1[a]	1*	
Other	1.04	(0.82, 1.34)	0.716	0.98	(0.76, 1.27)	0.890
Alcohol						
No	1*	1*		1*	1*	
Yes	1.0	(0.86, 1.16)	0.991	1.04	(0.89, 1.23)	0.597
Smoking						
No	1*	1*		1*	1*	
Yes	0.95	(0.73, 1.22)	0.686	0.82	(0.62, 1.09)	0.188
Living arrangements						
Alone	1*	1*		1*	1*	
Spouse only	1.16	(0.88, 1.52)	0.268	1.15	(0.87, 1.53)	0.307
Other	0.75	(0.59, 0.95)	0.022	0.89	(0.69, 1.16)	0.415
With child ‡	0.88	(0.73, 1.07)	0.234	0.83	(0.67, 1.03)	0.099
Activities of daily living §						
Independent	1*	1*		1*	1*	
Supervision	0.82	(0.68, 0.98)	0.028	0.84	(0.68, 1.00)	0.072
Limited	0.93	(0.74, 1.17)	0.525	0.88	(0.69, 1.12)	0.311
Extensive	0.74	(0.56, 0.97)	0.028	0.75	(0.57, 1.01)	0.055
Maximal	0.67	(0.47, 0.95)	0.023	0.75	(0.52, 1.08)	0.119
Dependent+	0.84	0.58, 1.20)	0.345	0.81	(0.55, 1.17)	0.262
Self Reported health						
Poor	1*	1*		1*	1*	
Excellent	0.71	(0.48, 1.03)	0.073	0.62	(0.41, 0.93)	0.023
Good	0.74	(0.56, 0.98)	0.042	0.63	(0.47, 0.85)	0.003
Fair	0.89	(0.66, 1.19)	0.454	0.78	(0.58, 1.05)	0.105
Couldn't respond	0.85	(0.61, 1.19)	0.363	0.88	(0.62, 1.25)	0.481

Hospitalisation						
No hospitalisation||	1*	1*		1*	1*	
Other	1.1	(0.96, 1.28)	0.155	1.19	(1.02, 1.38)	0.021
No of medications	1.12	(1.11, 1.13)	<0.001	1.22	(1.21, 1.23)	<0.001
Cancer						
No	1*	1*		1*	1*	
Yes	1.16	(0.95, 1.42)	0.156	1.35	(1.11, 1.66)	0.004
Dementia						
No	1*	1*		1*	1*	
Yes	1.11	(0.94, 1.31)	0.219	1.26	(1.05, 1.51)	0.011
Insomnia						
No	1*	1*		1*	1*	
Yes	1.44	(1.23, 1.69)	<0.001	1.80	(1.53, 2.11)	<0.001
Depression						
No	1*	1*		1*	1*	
Yes	1.24	(0.96, 1.61)	0.098	1.68	(1.28, 2.19)	<0.001
Anxiety						
No	1*	1*		1*	1*	
Yes	1.12	(0.84, 1.48)	0.431	1.77	(1.32, 2.36)	<0.001
Hemiplegia						
No	1*	1*		1*	1*	
Yes	1.22	(0.79, 1.88)	0.368	0.80	(0.51, 1.27)	0.351
Parkinson's Disease						
No	1*	1*		1*	1*	
Yes	0.93	(0.63, 1.37)	0.726	0.86	(0.58, 1.3)	0.487
Stroke						
No	1*	1*		1*	1*	
Yes	0.69	(0.58, 0.82)	<0.001	0.56	(0.47, 0.67)	<0.001
Coronary heart disease						
No	1*	1*		1*	1*	
Yes	1.07	(0.92, 1.24)	0.402	0.97	(0.83, 1.14)	0.706
Congestive-cardiac failure						
No	1*	1*		1*	1*	
Yes	0.88	(0.72, 1.07)	0.208	0.76	(0.62, 0.93)	0.008
Diabetes						
No	1*	1*		1*	1*	
Yes	0.75	(0.63, 0.89)	0.001	0.65	(0.54, 0.77)	<0.001
Chronic Obstructive Pulmonary Disease						
No	1*	1*		1*	1*	
Yes	0.79	(0.65, 0.96)	0.021	0.51	(0.41, 0.63)	<0.001
Bowel Incontinence						
No	1*	1*		1*	1*	

Yes	1.11	(0.91, 1.35)	0.300	1.08	(0.88, 1.33)	0.422
Urinary Incontinence ¶						
No	1*	1*		1*	1*	
Yes	1.07	(0.938, 1.24)	0.287	1.13	(0.97, 1.30)	0.110
Urinary tract infection						
No	1*	1*		1*	1*	
Yes	0.93	(0.69, 1.26)	0.654	1.19	(0.88, 1.62)	0.248
Falls						
No	1*	1*		1*	1*	
Yes	1.04	(0.91, 1.18)	0.581	1.07	(0.93, 1.24)	0.286
Fracture ††						
No	1*	1*		1*	1*	
Yes	1.08	(0.77, 1.51)	0.641	0.96	(0.67, 1.36)	0.838

*****= Reference value, **†**= 1 missing, **‡**= not spouse / partner, **§**=2 missing, **||**= in last 90 days, ¶=16 missing, †† =4 missing.