....

Healthcare use in patients with multimorbidity

Guilherme Quinaz Romana [1,2], Irina Kislaya [2,3], Susana Cunha Gonçalves [2,4],
Mário Rui Salvador [2,5], Baltazar Nunes [2,3], Carlos Matias Dias [2,3]

1 ACES Lisboa Norte Public Health Unit, Lisbon, Portugal
2 Departamento de Epidemiologia, Instituto Nacional de Saúde Doutor Ricardo Jorge, Lisbon, Portugal
3 Centro de Investigação em Saúde Pública, Escola Nacional de Saúde Pública, Universidade Nova de Lisboa, Lisbon, Portugal
4 ACES Médio Tejo Public Health Unit, Alcanena, Portugal
5 ACES Dão Lafões Public Health Unit, Viseu, Portugal

Correspondence: Guilherme Quinaz Romana, Unidade de Saúde Pública – Aces Lisboa Norte, Largo Professor Arnaldo Sampaio, 1549-010 Lisboa, Portugal, Tel: +351 217211860, Fax: +351217211801, e-mail: gquinaz.romana@gmail.com

Background: The existence of multiple chronic conditions in the same patient is a public health problem increasingly recognized as relevant to health systems. Individuals with multimorbidity have additional health needs, which imply a heavy burden in healthcare use. It is estimated that between 70% and 80% of the total health expenditure is used with chronic conditions. Patients with multimorbidity are responsible for up to 75% of primary care appointments. These patients are also high hospital users, with up to 14.6 times more risk of hospitalization. **Methods:** This study analyses the association between healthcare use and multimorbidity in the Portuguese population aged 25–74 years old. The association between socioeconomic variables and healthcare use was studied, based on data from the first Portuguese Health Examination Survey using a logistic regression model, stratified by sex and adjusted for socioeconomic confounding variables. **Results:** In patients with multimorbidity, there was a greater use of primary healthcare consultations, medical or surgical specialist consultations and hospitalizations. An association was established between female, older age groups and lower educational levels, and increased healthcare use. When adjusted to socioeconomic variables, the likelihood of using healthcare services can be as high as 3.5 times, when compared to patients without chronic conditions. **Conclusion:** Our results show a greater healthcare use in multimorbidity patients, both in primary and hospital care. The availability of scientific evidence regarding the use of healthcare services by multimorbidity patients may support health policy changes, which could allow a more efficient management of these patients.

....

Introduction

The presence of multiple chronic conditions coexisting in the same individual, and the expected increase in the diagnosis of these conditions over the next years, is increasingly recognized as a fundamental problem of public health and healthcare in contemporary societies.[1,2]

Individuals with multimorbidity will be more likely to have increased health needs resulting in increased workload for health services.[3,4] Published studies on the burden of multimorbidity in healthcare show different results. However, they all point to a higher use of healthcare services by these patients. Treatment of patients with chronic conditions accounts for up to 75% of all US health spending budget[4] and with an estimated average annual amount spent on health by a patient with one chronic illness of $850, rising to $6178 with three chronic illnesses and reaching $12 699 with four or more chronic illnesses.[5] In Europe, these pathologies account for 70–80% of health expenditure in countries such as Denmark and are the cause of 8 out of 11 hospital admissions in the UK.[4]

Patients with multimorbidity represent up to 78%[3] of primary care consultations with a mean of contacts ranging from 4.63 to 18.6[6] visits per year. These patients also show a high number of prescriptions and hospital referrals, estimating an annual average of 27.5 pharmacological prescriptions and 0.5 hospital referrals.[6]

The existence of multimorbidity is also of significant importance in the use of hospital care, not only in outpatient visits but also in the number of hospitalizations.[4,7] In US hospitals, 66% of all hospital discharges refer to patients with two or more chronic conditions. These patients also present a longer average time of hospitalization and higher associated costs.[8] Similar data are observed in Europe, with a link between the number of chronic conditions and the number and duration of hospitalizations.[9] Patients with three or more chronic conditions may be up to 14.6 times more likely to be hospitalized with a 25 times longer hospitalization time, when compared to patients without chronic conditions.[10]

Mostly research on healthcare use by patients with multimorbidity focuses on older adults.[2,4,6,7,9] Multimorbidity becomes progressively present with age, associated with increased mortality and reduced functional capacity.[11] Literature also shows the relationship between underprivileged social situations, such as low literacy levels, and the presence of multimorbidity.[9,12] The incidence of multimorbidity may occur between 10 and 15 years earlier in individuals with worse socioeconomic profile.[11] However, for younger population, questions related to multimorbidity and associated healthcare use have been overlooked. Evolution of medicine leads to sustainable increase in average life expectancy, which also implies to live more years with chronic conditions and longer need of care. Increased knowledge of the epidemiology and impact of patients with multimorbidity is particularly relevant in guiding the way healthcare is organized and provided.

This study focused on the analysis of the association between multimorbidity and healthcare use in the Portuguese population, between 25 and 74 years, considering age, sex, education, income and health regions as cofactors. The conclusions on this issue may support the discussion on how to manage patients with multimorbidity.

Methods

Study design

This study relies on data from the 'Inquérito Nacional de Saúde com Exame Físico (INSEF)'.

Detailed description of the sample design and methods of INSEF has been published elsewhere.[13] Briefly, INSEF is a cross-sectional, observational, epidemiological study that collected data on a representative probabilistic sample ($n = 4911$) of community-dwelling individuals aged 25–74 years old resident in Portugal in 2015.

The variables of interest were collected through Computer-Assisted Personal Interview using the REDCap—Research Electronic Data Capture software.[14]

Measures

The frequency of healthcare utilization was measured by three questions:

> 'During the past 4 weeks, how many times did you consult a GP (general practitioner) or family doctor on your own behalf?'
> 'During the past 4 weeks, how many times did you consult a medical or surgical specialist on your own behalf?'
> 'In the past 12 months how many times have you been admitted to hospital as an inpatient, which is overnight or longer?'

Based on these questions three primary outcome variables were defined: number of medical or surgical specialist consultations in the last 4 weeks; number of primary care consultations in the last 4 weeks and number of hospitalizations in the last year. In addition, binary measures of primary and hospital care utilization (yes/no) were defined.

The multimorbidity variable was defined by the simultaneous presence of two or more chronic conditions[15] from a list of 20 pathologies,[16] the selection of which was based on previous National Health Surveys, the European Health Examination Survey (EHES) as well as on the National Health Plan 2013–2016 (Supplementary table S1).

Variables of sociodemographic characterization were also selected, namely sex, age group, education, adult-equivalized household income (OECD modified equivalence scale)[17] and health region.

Statistical analysis

To describe survey participants, counts and percentages were used for categorical variables, means and standard deviation for numerical variables. The Mann–Whitney and Kruskal–Wallis tests were applied to compare number of medical or surgical specialist consultations, number of primary care consultations and number of hospitalizations between different population subgroups.

Factors associated with each of three types of healthcare use were analysed using multivariable logistic regression models. Magnitude of associations was measured by adjusted odds ratios (AOR). Separate models were fitted for male and female and adjusted for predisposing (age group and education), enabling (income and region of residence) and need characteristics (multimorbidity) variables chosen based on Andersen's model of healthcare use.[18]

In the analysis of healthcare use for each additional chronic condition, the number of medical or surgical specialist consultations and the number of primary care consultations were used as a single-dependent variable. In this analysis, the various chronic conditions were grouped by their common pathophysiological mechanisms and compared using a Kruskal–Wallis test. The limit of four or more additional conditions was selected since it contained 94% of the sample.

The statistical analysis was performed using the (SVY) package of Stata 15.1[19] and the Survey Package of R.[20] All statistical analyses were performed using sampling weights, to provide nationally representative results.

Ethical issues

The INSEF study received ethical approval from the Ethics Commission of the Portuguese National Health Institute Doutor Ricardo Jorge, the National Data Protection Authority (no 9348/ 2010) and project partners' Ethics Commissions. All participants provided an informed consent form.

Results

The final sample size consisted in 4911 individuals, of which 47.5% were males. The participants' characteristics are described in table 1.

We found a multimorbidity prevalence of 38.3% confidence interval (CI) 95% (35.4–41.3%). Patients with multimorbidity reported higher healthcare use, with primary care consultations in the previous 4 weeks of 0.28; mean medical or surgical specialist consultations in the previous 4 weeks of 0.25 and hospitalization mean in the previous year of 0.17. These values contrast with the means presented by patients without chronic conditions, respectively, 0.09; 0.12; and 0.11 and by patients with only one chronic condition, respectively, 0.14; 0.18; and 0.16 (table 2).

A greater healthcare use, with statistically significant values for the number of medical or surgical specialist consultations and primary care consultations was observed for females, while no association was verified between sex and number of hospitalizations. The older age groups showed more frequent healthcare use with statistically significant values for medical or surgical specialist consultations and primary care consultations (table 2).

Socioeconomic gradients in hospital and primary care utilization were observed. Population groups with higher income and higher educational qualifications had more medical or surgical specialist

Table 1 Sociodemographic and health status characteristics of study participants

		Freq[a] (n)
Multimorbidity	2 or more chronic conditions	38.3% (1862)
Chronic conditions	0 chronic conditions	42.2% (2055)
	1 chronic condition	19.4% (930)
	2 chronic conditions	17.0% (838)
	3 chronic conditions	10.4% (474)
	4 chronic conditions	5.2% (264)
	5 chronic conditions	3.0% (139)
	6 chronic conditions	1.3% (68)
	7 chronic conditions	0.7% (46)
	8 chronic conditions	0.4% (21)
	9 or more chronic conditions	0.3% (10)
Sex	Male	47.5% (2646)
	Female	52.5% (2245)
Age	25–34	18.3% (714)
	35–44	23.5% (1135)
	45–54	22.4% (1193)
	55–64	19.9% (1098)
	65–74	15.9% (771)
Education	Cannot read or write/ elementary school	27.7% (1516)
	Middle school	31.5% (1595)
	Secondary school	21.4% (958)
	Higher education	19.4% (838)
Income[b]	Low	19.8% (1092)
	Medium–low	18.4% (929)
	Medium	20.4% (872)
	Medium–high	19.7% (837)
	High	21.7% (914)
Health region	Norte	35.4% (777)
	Centro	16.2% (706)
	Lisboa e Vale do Tejo	34.8% (650)
	Alentejo	4.6% (690)
	Algarve	4.2% (644)
	AR of Madeira	2.5% (695)
	AR of Azores	2.3% (749)

[a]Relative frequencies weighted for the Portuguese population distribution by health region, sex and age group in 2015.
[b]Quintiles of adult-equalized household income from low (first quintile) to high (fifth quintile).

Table 2 Healthcare use (primary care consultations, medical or surgical specialist consultations and hospitalizations) by sex, age group, education, income, health region and presence of chronic conditions

		Hospitalizations (previous 12 months)		Medical or surgical specialist consultations (previous 4 weeks)		Primary care consultations (previous 4 weeks)	
		Mean (SD)	*P*-value	Mean (SD)	*P*-value	Mean (SD)	*P*-value
Overall		0.13 (0.55)		0.17 (0.45)		0.18 (0.42)	
Multimorbidity	0 chronic conditions	0.09 (0.33)	<0.001	0.12 (0.39)	<0.001	0.11 (0.35)	<0.001
	1 chronic condition	0.14 (0.76)		0.18 (0.43)		0.16 (0.41)	
	2 or more chronic conditions	0.17 (0.61)		0.25 (0.51)		0.28 (0.47)	
Sex	Male	0.14 (0.68)	0.564	0.14 (0.40)	<0.05	0.15 (0.38)	<0.001
	Female	0.12 (0.39)		0.21 (0.49)		0.22 (0.45)	
Age	25–34	0.14 (0.47)	0.122	0.15 (0.44)	<0.001	0.13 (0.36)	<0.001
	35–44	0.08 (0.31)		0.15 (0.43)		0.15 (0.41)	
	45–54	0.16 (0.73)		0.16 (0.44)		0.17 (0.42)	
	55–64	0.18 (0.70)		0.22 (0.48)		0.23 (0.44)	
	65–74	0.12 (0.35)		0.23 (0.47)		0.26 (0.46)	
Education	Cannot read or write/elementary school	0.13 (0.39)	0.311	0.17 (0.43)	<0.001	0.26 (0.47)	<0.001
	Middle school	0.14 (0.44)		0.15 (0.43)		0.19 (0.44)	
	Secondary school	0.13 (0.60)		0.17 (0.43)		0.14 (0.36)	
	Higher education	0.14 (0.74)		0.25 (0.53)		0.11 (0.36)	
Income[a]	Low	0.15 (0.47)	0.214	0.15 (0.43)	<0.05	0.25 (0.47)	<0.001
	Medium–low	0.17 (0.74)		0.13 (0.36)		0.21 (0.47)	
	Medium	0.11 (0.37)		0.17 (0.40)		0.19 (0.41)	
	Medium–high	0.15 (0.77)		0.19 (0.48)		0.15 (0.36)	
	High	0.11 (0.36)		0.24 (0.53)		0.13 (0.38)	
Health region	Norte	0.12 (0.39)	<0.05	0.21 (0.49)	<0.05	0.23 (0.44)	<0.001
	Centro	0.11 (0.35)		0.12 (0.35)		0.16 (0.40)	
	Lisboa e Vale do Tejo	0.17 (0.77)		0.18 (0.45)		0.15 (0.39)	
	Alentejo	0.10 (0.34)		0.15 (0.46)		0.25 (0.58)	
	Algarve	0.12 (0.45)		0.17 (0.47)		0.19 (0.43)	
	AR of Madeira	0.08 (0.35)		0.15 (0.40)		0.12 (0.35)	
	AR of Azores	0.09 (0.09)		0.13 (0.36)		0.12 (0.34)	

AR: autonomous region; SD: standard deviation.
[a]Quintiles of adult-equalized household income from low (first quintile) to high (fifth quintile).

consultations and less primary care consultations, while populations with lower incomes and lower educational qualifications had opposite results (table 2).

In logistic regression models, the analysis was adjusted for age, education, income and health region. Patients with multimorbidity presented a 3.660 AOR 95% CI (2.316–5.797) in males and 2.590 AOR CI 95% (1.573–4.264) in females for primary care consultations, compared to patients without chronic conditions. Considering patients with one chronic condition as reference, for primary care consultations, male patients with multimorbidity have a 2.421 AOR 95% CI (1.321–4.439) and female patients a 1.729 OR 95% CI (1.054–2.837) (table 3).

For medical or surgical specialist consultations, the AOR of patients with multimorbidity in relation to patients without chronic conditions is 1.897 95% CI (1.068–3.372) in males and 2.869 95% CI (2.033–3.882) in females. Regarding the group of patients with one chronic condition, the multimorbidity individuals AOR is 1.630 95% CI (1.213–2.191) in the females. There is no association in males (table 3).

For males with two or more conditions, the odds of reporting hospitalizations in the past 12 months were 1.781 times as high (AOR = 1.781, 95% CI 1.181–2.684) as for those without chronic conditions. No association was observed for females (table 3).

The conditions with the greatest use of both primary and specialist care consultations were musculoskeletal and mental health groups (table 4).

Although there was an increased use of healthcare for each additional chronic condition, data showed that this increased use was not proportional to the greater number of conditions. However, the group of patients with mental disorders had a higher number of visits when accompanied by four or more additional chronic conditions. On the other hand, patients with musculoskeletal conditions had the lowest mean number of visits when they present four or more additional chronic conditions.

Discussion

Using nationally representative data, this study found an association between multimorbidity and healthcare use. Individuals with multimorbidity reported more primary care visits, more hospital visits and more hospitalizations than those without chronic conditions.

Portugal health system combines a universal, financed mainly through taxation, National Health Service (NHS), public and private health insurance schemes and voluntary health insurance. The Ministry of Health is responsible for central planning and regulation, whereas the management of the NHS takes place at the regional level, by the Regional Health Administrations. Public primary care, which intends to be a gatekeeper to the system, provides GP consultations. On the other hand, public hospitals are responsible for almost all other medical or surgical specialist consultations. The private sector, which has mainly a supplementary role to universal NHS, has both GP and specialist consultations.[21]

The lack of a consensually accepted definition for multimorbidity limits the comparison with other studies.[22] The use of different measurements for the same problem, using different population samples, different age ranges and different number and type of comorbidities, makes it difficult to extrapolate the results.[23] The data sources are also different, although there are several studies

Table 3 Logistic regression models for primary care consultations, medical or surgical specialist consultations and hospitalizations, stratified by sex and adjusted to age group, education, income and health region

		Primary care consultations				Medical or surgical specialist consultations				Hospitalizations			
		Male		Female		Male		Female		Male		Female	
		AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value	AOR (95% CI)	P-value
Multimorbidity	0 chronic conditions (REF)	1		1		1		1		1		1	
	2 or more chronic conditions	3.660 (2.316–5.797)	<0.001	2.590 (1.573–4.264)	<0.001	1.897 (1.068–3.372)	<0.05	2.809 (2.033–3.882)	<0.001	1.781 (1.181–2.684)	<0.05	1.686 (0.914–3.110)	0.092
Multimorbidity	1 chronic condition (REF)	1		1		1		1		1		1	
	2 or more chronic conditions	2.421 (1.321–4.439)	<0.05	1.729 (1.054–2.837)	<0.05	1.173 (0.760–1.810)	0.460	1.630 (1.213–2.191)	<0.05	1.578 (0.854–2.913)	0.140	1.514 (0.920–2.491)	0.100
Age group	25–34 (REF)	1		1		1		1		1		1	
	35–44	0.968 (0.395–2.376)	0.943	0.823 (0.558–1.217)	0.319	1.044 (0.420–2.595)	0.925	1.007 (0.714–1.418)	0.966	1.312 (0.542–3.173)	0.537	0.371 (0.268–0.516)	<0.001
	45–54	0.767 (0.254–2.314)	0.628	0.684 (0.390–1.201)	0.180	1.662 (0.701–3.937)	0.240	0.840 (0.399–1.766)	0.637	2.201 (0.930–5.209)	0.071	0.477 (0.274–0.831)	<0.05
	55–64	1.615 (0.647–4.029)	0.295	0.518 (0.344–0.779)	<0.05	2.496 (1.170–5.325)	<0.05	0.994 (0.650–1.521)	0.978	2.091 (1.165–3.754)	<0.05	0.560 (0.303–1.032)	0.062
	65–74	1.333 (0.589–3.019)	0.480	0.784 (0.398–1.542)	0.469	2.739 (1.187–6.322)	<0.05	0.863 (0.550–1.355)	0.512	1.326 (0.498–3.529)	0.562	0.387 (0.192–0.781)	<0.05
Education	Cannot read or write/elementary school (REF)	1		1		1		1		1		1	
	Middle school	0.970 (0.536–1.756)	0.919	0.861 (0.596–1.241)	0.413	1.171 (0.737–1.861)	0.493	1.119 (0.765–1.418)	0.522	1.075 (0.618–1.870)	0.793	1.035 (0.605–1.770)	0.897
	Secondary school	1.030 (0.584–1.814)	0.917	0.683 (0.40–1.168)	0.159	1.292 (0.702–2.377)	0.399	1.598 (1.020–2.501)	<0.05	0.859 (0.373–1.978)	0.714	1.249 (0.698–2.235)	0.443
	Higher education	0.550 (0.191–1.578)	0.257	0.471 (0.274–0.810)	<0.05	2.800 (1.304–6.015)	<0.05	1.716 (1.067–2.759)	<0.05	1.356 (0.564–3.263)	0.486	0.691 (0.366–1.307)	0.248
Income[a]	Low (REF)	1		1		1		1		1		1	
	Medium–low	0.501 (0.298–0.842)	<0.05	0.865 (0.534–1.403)	0.548	0.586 (0.253–1.361)	0.206	1.247 (0.827–1.878)	0.282	0.868 (0.588–0.282)	0.466	1.177 (0.755–1.833)	0.461
	Medium	0.763 (0.461–1.260)	0.281	0.664 (0.342–1.289)	0.219	1.018 (0.443–2.338)	0.966	1.278 (0.838–1.951)	0.246	0.592 (0.400–0.886)	<0.05	0.904 (0.496–1.647)	0.735
	Medium–high	0.522 (0.295–0.923)	<0.05	0.623 (0.378–1.029)	0.064	0.903 (0.382–2.130)	0.810	1.325 (0.938–1.872)	0.107	0.571 (0.372–0.877)	<0.05	1.132 (0.594–2.156)	0.699
	High	0.482 (0.277–0.840)	<0.05	0.657 (0.34–1.250)	0.193	1.099 (0.427–2.827)	0.840	1.515 (0.934–2.457)	0.090	0.651 (0.392–1.081)	0.095	1.178 (0.697–1.992)	0.530
Health region	Norte (REF)	1		1		1		1		1		1	
	Centro	0.643 (0.364–1.104)	0.104	0.763 (0.498–1.170)	0.209	0.510 (0.240–1.083)	0.078	0.671 (0.558–0.807)	<0.001	0.779 (0.484–1.253)	0.293	1.293 (0.638–2.619)	0.464
	Lisboa e Vale do Tejo	0.543 (0.315–0.937)	<0.05	0.666 (0.456–0.974)	<0.05	0.750 (0.421–1.334)	0.317	0.682 (0.487–0.811)	<0.001	1.010 (0.725–1.406)	0.953	1.257 (0.747–2.117)	0.379
	Alentejo	0.844 (0.557–1.279)	0.412	0.946 (0.584–1.533)	0.817	0.593 (0.299–1.174)	0.129	0.518 (0.327–0.821)	<0.05	0.658 (0.392–1.101)	0.108	0.975 (0.589–1.617)	0.922
	Algarve	0.800 (0.461–1.387)	0.415	0.713 (0.547–0.928)	<0.05	0.617 (0.352–1.084)	0.091	0.702 (0.495–0.994)	<0.05	0.837 (0.366–1.918)	0.667	1.006 (0.669–1.514)	0.975
	AR of Madeira	0.581 (0.389–0.868)	<0.05	0.395 (0.264–0.592)	<0.001	0.542 (0.288–1.022)	0.058	0.933 (0.686–1.270)	0.652	0.376 (0.269–0.526)	<0.001	0.842 (0.525–1.349)	0.463
	AR of Azores	0.543 (0.284–1.042)	0.065	0.433 (0.306–0.612)	<0.001	0.600 (0.333–1.083)	0.088	0.604 (0.404–0.906)	<0.05	0.644 (0.438–0.945)	<0.05	0.807 (0.504–1.298)	0.369

AR: autonomous region.
[a]Quintiles of adult-equalized household income from low (first quintile) to high (fifth quintile).

Table 4 Healthcare use by disease group and by additional chronic condition

	Number of consultations					
	Additional chronic conditions					
	0, mean (SD)	1, mean (SD)	2, mean (SD)	3, mean (SD)	4 or more, mean (SD)	*P*-value
Cardio and cerebrovascular conditions[a]	0.29 (0.077)	0.44 (0.049)	0.46 (0.048)	0.60 (0.067)	0.67 (0.088)	<0.001
Lung conditions[b]	0.36 (0.129)	0.48 (0.201)	0.54 (0.122)	0.47 (0.235)	0.63 (0.140)	0.196
Gastric conditions[c]	0.30 (0.148)	0.24 (0.073)	0.60 (0.149)	0.68 (0.175)	0.56 (0.083)	<0.05
Musculoskeletal conditions[d]	0.46 (0.105)	0.42 (0.067)	0.59 (0.063)	0.58 (0.055)	0.52 (0.079)	<0.05
Mental health diseases[e]	0.44 (0.063)	0.44 (0.055)	0.58 (0.076)	0.57 (0.071)	0.80 (0.085)	<0.001
Endocrinological pathologies[f]	0.31 (0.059)	0.39 (0.058)	0.52 (0.035)	0.54 (0.084)	0.71 (0.074)	<0.001
Renal conditions[g]	1 (0.000)	1.56 (0.877)	0	0	0.51 (0.506)	*
Chronic pain	0.41 (0.102)	0.53 (0.163)	0.81 (0.107)	0.57 (0.084)	0.79 (0.111)	0.228
Cancer	0.56 (0.135)	0.58 (0.167)	0.84 (0.229)	0.67 (0.150)	0.72 (0.196)	0.942
Allergic conditions	0.27 (0.044)	0.42 (0.118)	0.53 (0.093)	0.54 (0.131)	0.69 (0.144)	<0.001

COPD: chronic obstructive pulmonary disease; HBP: high blood pressure.
[a]HBP; acute myocardial infarction; stroke and cardiac arrhythmia.
[b]Asthma and COPD.
[c]Liver cirrhosis; chronic hepatitis and gastric or duodenal ulcer.
[d]Osteoporosis; arthrosis and rheumatoid arthritis.
[e]Depression and chronic anxiety.
[f]Diabetes e hypercholesterolemia.
[g]Chronic renal disease.
*No test was performed due to the low frequencies found.

based on population surveys,[24–26] most of the studies in this area are based on clinical records.[3,6,11,27]

The greater use of healthcare among patients with multimorbidity at both primary and hospital levels has been described by previous studies in Europe.[9] It is explained by the higher complexity of these patients and their greater treatment needs. Although there is a common trend, results vary by country depending on the specificities of health systems.[28] Bähler et al.[29] reported for Swiss patients with multimorbidity, aged over 65 on average, 7.4 medical consultations per year in primary healthcare; 5.1 medical or surgical specialist consultations; and 1.5 hospitalizations. In the Netherlands average annual number of primary care visits of patients with multimorbidity varied between 8.54[30] and 4.8.[6] In Scotland, Glynn et al.[4] reported an annual average of 6.88 primary care consultations for patients with multimorbidity.

We observed an average of 0.28 primary care visits and 0.25 hospital visits over a 4 weeks period. Taking into account the expected systematic rate of chronic condition consultations, as well as the fact that the interviews conducted at INSEF took place throughout the year, we can infer that the values found correspond to an annual mean of 3.36 primary care consultations and 3 medical or surgical specialist consultations. When we refer to hospitalizations, the annual values obtained—0.17—are also lower, in comparison with literature.[4,29] These lower than expected frequencies may be explained by the data source—population-based—and data collection methodology used, namely self-report.

Socioeconomic factors, age and sex are referred as important cofactors of this association. Both the increase in age[31] and the existence of fragile socioeconomic conditions[32] are associated with higher prevalence of multimorbidity and healthcare use. One of the reasons for the association between socioeconomic context and multimorbidity may be the higher prevalence exposure to risk factors for chronic conditions in populations with worse socioeconomic conditions.[29] In Portugal there is a greater use of primary healthcare among less differentiated individuals, to the detriment of medical or surgical specialist consultations, whereas patients with higher income and higher educational qualifications use more medical or surgical specialist consultations. This discrepancy may be explained by a problem of healthcare access,[33] with a

proportion of the population resorting directly to secondary care. Fjær et al.[34] reports a similar pattern of healthcare use at European level, explaining it by the differentiated individuals greater availability of resources, which allow them to go directly to a specialized physician. As for gender, the healthcare use is usually described as higher in women,[23] which is in line with our results.

When adjusted for socioeconomic variables, we found that the likelihood of patients with multimorbidity resorting to health services remained high. For women and men with multimorbidity the odds of primary care use were 3.5 times and 2.5 times as high when for those without chronic conditions, respectively. The hospital reality shows similar results, with the likelihood of patients with multimorbidity using medical or surgical specialist consultations, being approximately two times higher in women and three times higher in men, also when compared to patients without chronic conditions.

We found that healthcare use for each additional chronic condition did not increase proportionately. The increase number of chronic conditions resulted in a decreased number of consultations per condition. This may be due to the similar pathophysiological mechanisms between conditions, enhancing the treatments performed, or the prioritization of certain chronic conditions to the detriment of other.[6]

Patients with multimorbidity can benefit the most from integrated healthcare.[30] It is appropriate to reach a commitment with the patient not only regarding his treatment plan, taking into account his expectations and priorities, but also with the health professional who manages the patient and is responsible for the communication and coordination between the various services involved.[35] Clinical governance could play an important role as the conceptual framework of multichronicity management, by promoting an integrated effort to improve quality, patient satisfaction, activation and self-management, performance monitoring, clinical risk management, education and learning.[36] It is also possible to intervene in medical practice by reformulating clinical guidelines. The existing recommendations for different pathologies should contain cross references, when there are synergistic or contradictory effects between them, as well as identifying possible interactions between the recommended treatment and common prescription drugs.[37]

Limitations and strengths

We point out that individuals who have accepted to participate in INSEF may be the persons who use the services more often. In addition, the data collection mode, based on National Register of Health Service Users (RNU) and carried out in public healthcare centres, may have left out users who favour private health services, probably with higher socioeconomic status. Another important limitation is the exclusion of individuals over 75 years old, which may underestimate the prevalence of multimorbidity and the use of health services. Furthermore, INSEF data were collected in healthcare facilities, so older people with mobility problems may be underrepresented. This may also result in underestimation of health services frequency use. Taken into consideration that INSEF data were collected through self-report, memory bias could be present, which can underestimate our results.

The data collection methodology for chronic conditions does not contemplate severity. The need for care and subsequent use of services may be modified by the severity of the conditions. It should also be mentioned that the questions that give rise to the variables of primary care consultations and medical or surgical specialist consultations refer only to the 4 weeks prior to the collection of information, which may underestimate services use. Sample size and questioning at different points of time can mitigate this limitation. Statistically it was also possible to deal with this limitation through the use of non-parametric tests. To measure the association between multimorbidity and healthcare use we have tried to model the number of consultations in primary care or with medical or surgical specialist and the number hospitalizations instead of binary variables, using more informative models, like zero-inflated negative binomial regression. Unfortunately, these models failed to converge for all the outcomes in the study. For the sake of comparability, we have opted for a more simple approach by adjusting a logistic regression models for the binary outcomes.

The existence of a population-based study, with national representativeness and a wide age bracket, allows a better patient characterization.

For future research we consider to be relevant the inclusion of emergency services data.

Conclusion

The relevance of this study lies on the production of scientific evidence regarding multimorbidity and healthcare use in Portugal. This evidence may substantiate the discussion about the possible need for the Portuguese health system to adapt to these patients, with changes in policies that will allow better and more efficient treatment, as an individual healthcare plan for patients with multiple conditions.

Supplementary data

Supplementary data are available at *EURPUB* online.

Acknowledgements

The authors are grateful to all the professionals who were involved in the INSEF implementation and to all the INSEF participants.

Funding

Conflicts of interest: None declared.

Key points

- The management of patients with multimorbidity is complex, these patients have greater healthcare needs, which represent a heavy burden to health systems.
- Patients with multimorbidity have more primary care visits, more medical or surgical specialist consultations and more hospitalizations.
- Further discussion on policy change is needed, targeting a more efficient treatment of these patients.

References

1   Vogeli C, Shields AE, Lee TA, et al. Multiple chronic conditions: prevalence, health consequences, and implications for quality, care management, and costs. *J Gen Intern Med* 2007;22:391–5.

2   Marengoni A, Angleman S, Melis R, et al. Aging with multimorbidity: a systematic review of the literature. *Ageing Res Rev* 2011;10:430–9.

3   Salisbury C, Johnson L, Purdy S, et al. Epidemiology and impact of multimorbidity in primary care: a retrospective cohort study. *Br J Gen Pract* 2011;61:12–21.

4   Glynn LG, Valderas JM, Healy P, et al. The prevalence of multimorbidity in primary care and its effect on health care utilization and cost. *Fam Pract* 2011;28:516–23.

5   Anderson G, Horvath J. *Medical Expenditure Panel Survey Partnership for Solutions.* Anderson C, editor. Baltimore: Johns Hopkins University, 2002.

6   van Oostrom SH, Picavet HSJ, de Bruin SR, et al. Multimorbidity of chronic diseases and health care utilization in general practice. *BMC Fam Pract* 2014;15:61.

7   Condelius A, Edberg AK, Jakobsson U, Hallberg IR. Hospital admissions among people 65+ related to multimorbidity, municipal and outpatient care. *Arch Gerontol Geriatr* 2008;46:41–55.

8   Steiner CA, Friedman B. Hospital utilization, costs, and mortality for adults with multiple chronic conditions, nationwide inpatient sample, 2009. *Prev Chronic Dis* 2013;10:120292.

9   Palladino R, Lee JT, Ashworth M, et al. Associations between multimorbidity, healthcare utilisation and health status: evidence from 16 European countries. *Age Ageing* 2016;45:431–5.

10 Schneider KM, O'Donnell BE, Dean D. Prevalence of multiple chronic conditions in the United States' Medicare population. *Health Qual Life Outcomes* 2009;7:82.

11 Barnett K, Mercer SW, Norbury M, et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet* 2012;380:37–43.

12 Wang HHX, Wang JJ, Lawson KD, et al. Relationships of multimorbidity and income with hospital admissions in 3 health care systems. *Ann Fam Med* 2015;13:164–7.

13 Nunes B, Barreto M, Gil AP, et al. The first Portuguese National Health Examination Survey (2015): design, planning and implementation. *J Public Health (Bangkok)* 2018;1–7.

14 Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377–81.

15 Mercer S, Salisbury C, Fortin M. *ABC of Multimorbidity.* BMJ Books, 2014.

16 Santos AJ, Gil AP, Kislaya I, et al. *1° Inquérito Nacional de Saúde com Exame Físico (INSEF 2015): relatório metodológico.* 1ª Edição. Lisboa: Instituto Nacional de Saúde Doutor Ricardo Jorge (INSA, IP), 2016.

17 Hagenaars A, de Vos K, Zaid M. *Poverty Statistics in the late 1980s: Research Based on Micro-Data.* Rotterdam: Office for Official Publications of the European Communities, 1994.

18 Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav* 1995;36:1.

19 StataCorp. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LP, 2017.

20 Lumley T. Analysis of Complex Survey Samples. R package version 3.34. Department of Biostatistics, University of Washington, 2018.

21 Simões JDA, Augusto GF, Fronteira I, Hernández-Quevedo C. Health Systems in Transition: Portugal Health System Review, Vol. 19. Lisbon: European Observatory on Health Systems and Policies, 2017.

22 Lefèvre T, d'Ivernois J-F, De Andrade V, et al. What do we mean by multimorbidity? An analysis of the literature on multimorbidity measures, associated factors, and impact on health services organization. *Rev Epidemiol Sante Publique* 2014;62:305–14.

23 Violan C, Foguet-Boreu Q, Flores-Mateo G, et al. Prevalence, determinants and patterns of multimorbidity in primary care: a systematic review of observational studies. *PLoS One* 2014;9:3–11.

24 Hoffman C, Rice D, Sung HY. Persons with chronic conditions. Their prevalence and costs. *JAMA* 1996;276:1473–9.

25 Puth MT, Weckbecker K, Schmid M, Münster E. Prevalence of multimorbidity in Germany: impact of age and educational level in a cross-sectional study on 19,294 adults. *BMC Public Health* 2017;17:1–7.

26 Garin N, Olaya B, Perales J, et al. Multimorbidity patterns in a national representative sample of the Spanish adult population. *PLoS One* 2014;9:e84794.

27 Prazeres F, Santiago L. Prevalence of multimorbidity in the adult population attending primary care in Portugal: a cross-sectional study. *BMJ Open* 2015;5:e009287.

28 Lehnert T, Heider D, Leicht H, et al. Review: health care utilization and costs of elderly persons with multiple chronic conditions. *Med Care Res Rev* 2011;68:387–420.

29 Bähler C, Huber CA, Brüngger B, Reich O. Multimorbidity, health care utilization and costs in an elderly community-dwelling population: a claims data based observational study. *BMC Health Serv Res* 2015;15:1–12.

30 Hopman P, Heins MJ, Korevaar JC, et al. Health care utilization of patients with multiple chronic diseases in the Netherlands: differences and underlying factors. *Eur J Intern Med* 2016;35:44–50.

31 Fortin M, Bravo G, Hudon C, et al. Prevalence of multimorbidity among adults seen in family practice. *Ann Fam Med* 2005;3:223–8.

32 Marengoni A, Winblad B, Karp A, Fratiglioni L. Prevalence of chronic diseases and multimorbidity among the elderly population in Sweden. *Am J Public Health* 2008;98:1198–200.

33 Observatório Português dos Sistemas de Saúde – OPSS. Viver em tempos incertos: sustentabilidade e equidade na saúde. Relatório de Primavera 2017. Lisbon, 2017; 1–186.

34 Fjær EL, Balaj M, Stornes P, et al. Exploring the differences in general practitioner and health care specialist utilization according to education, occupation, income and social networks across Europe: findings from the European social survey (2014) special module on the social determinant. *Eur J Public Health* 2017;27:73–81.

35 National Institute for Health and Care Excellence. Multimorbidity: Clinical Assessment and Management. Natl Guidel Cent, 2016; 2–23.

36 Buja A, Toffanin R, Claus M, et al. Developing a new clinical governance framework for chronic diseases in primary care: an umbrella review. *BMJ Open* 2018;8:e020626.

37 Hughes LD, McMurdo MET, Guthrie B. Guidelines for people not for diseases: the challenges of applying UK clinical guidelines to people with multimorbidity. *Age Ageing* 2013;42:62–9.