

# BMJ Open Profile, cost and pattern of prescriptions for polymedicated patients in Catalonia, Spain

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## ABSTRACT

**Objectives:** Polypharmacy is one of the main management issues in public health policies because of its financial impact and the increasing number of people involved. The polymedicated population according to their demographic and therapeutic profile and the cost for the public healthcare system were characterised.

**Design:** Cross-sectional study.

**Setting:** Primary healthcare in Barcelona Health Region, Catalonia, Spain (5 105 551 inhabitants registered).

**Participants:** All insured polymedicated patients. Polymedicated patients were those with a consumption of  $\geq 16$  drugs/month.

**Main outcomes measures:** The study variables were related to age, gender and medication intake obtained from the 2008 census and records of prescriptions dispensed in pharmacies and charged to the public health system.

**Results:** There were 36 880 polymedicated patients (women: 64.2%; average age:  $74.5 \pm 10.9$  years). The total number of prescriptions billed in 2008 was 2 266 830 (2 272 920 total package units). The most polymedicated group (up to 40% of the total prescriptions) was patients between 75 and 84 years old. The average number of prescriptions billed monthly per patient was  $32 \pm 2$ , with an average cost of  $\text{€}452.7 \pm 27.5$ . The total cost of those prescriptions corresponded to 2% of the drug expenditure in Catalonia. The groups N, C, A, R and M represented 71.4% of the total number of drug package units dispensed to polymedicated patients. Great variability was found between the medication profiles of men and women, and between age groups; greater discrepancies were found in paediatric patients (5–14 years) and the elderly ( $\geq 65$  years).

**Conclusions:** This study provides essential information to take steps towards rational drug use and a structured approach in the polymedicated population in primary healthcare.

## INTRODUCTION

Polymedication is becoming an increasingly important issue in public health policies and

## Strengths and limitations of this study

- This study includes 1-year monitoring of a large sample size, and provides a way to examine drug use under real-life situations, linked to practice through the prescriber and also to the patient. This information is essential in order to take steps towards rational drug use and a structured approach in the polymedicated population.
- Administrative information systems are not perfect and could limit the measurement of data quality in electronic records.
- Information related to prescription rates and costs should be viewed cautiously, due to the different forms of presentation and costs of medicines in other countries.

it may have a negative impact on patients and the healthcare system.<sup>1</sup> Among the reasons that contribute to the increase in polymedication are the ageing population, the prevalence of chronic diseases and the increased availability of drugs and access to healthcare services.<sup>2–3</sup>

In quantitative terms, polymedication is defined as various drugs taken simultaneously by the same user.<sup>4</sup> Although there is no consensus on the number of drugs a patient must take to be classified as polymedicated, four or more seems to be the accepted figure in most cases.<sup>5</sup> However, several studies suggest that the average number of drugs consumed daily by the elderly is 4.2–8,<sup>6–8</sup> with a maximum of 17 different drugs/day.<sup>7</sup>

In general, polymedication is more common among women, institutionalised patients and in rural areas, and is directly related to the number of prescribers.<sup>9–11</sup> In addition, comorbidities increase with age and the number of drugs prescribed.<sup>12–13</sup> Hence, there is an increased risk of medication-related problems that can cause treatment failure, poisoning and an increased number of hospital admissions.<sup>5–13–14</sup>

At the very least, periodically reviewing the treatment regimen of polymedicated patients may prevent these several problems and help professionals rationalise the use of medication.<sup>11 14 15</sup> Thus, implementing programmes to analyse and support polymedicated patients has become one of the priorities of the various national health services,<sup>16–20</sup> including the Spanish National Health Service<sup>14</sup> and the regional health administrations of Spain. However, no studies to describe the pattern of consumption in Spain have been carried out till today.

A suitable setting for the consideration of the wide range of issues related to polypharmacy is the Barcelona Health Region (BHR). This region's population lives in both rural and urban areas and has access to various types of healthcare services.<sup>21</sup> Thus, the objectives of this study were first to determine the number and prevalence of polymedicated patients receiving 16 or more medications in the public healthcare system in BHR, in order to describe the profile of polymedicated patients and identify their costs. Second, to describe the medications prescribed in the study population, differentiated by age and gender.

## METHODS

### Design and setting of the study

A cross-sectional observational study of all the insured polymedicated patients in 2008. The study was performed in the field of primary healthcare and, specifically, in BHR.

### Data source

The study used population data from the 2008 Catalonia census.<sup>22</sup> According to the census, BHR had 5 105 551 registered inhabitants, 2 604 190 (51% of the total) of whom were women, accounting for 68% of the total population of Catalonia. The age distribution of this region population showed predominance of adults (34% of the population was between 25 and 44).

Records of billed prescriptions dispensed in pharmacies and charged to the Catalan Health Service were also utilised. This information was obtained by means of the personal healthcare card, the document that provides citizens with access to the centres, services and provisions of the public health system (these services include drugs subsidised by the Catalan Health Service). This information is stored monthly in a computer system, which allows the information required for the management and monitoring of pharmaceutical services to be designed and collected.

### Data collection and variables

A polymedicated user in the present study was defined as someone receiving 16 or more active principles in a month. The control of the polymedicated population in Catalonia and each health region (number of users and drug consumption bill) following this criteria is part of the Efficiency Indicators in Primary Care, and is

periodically evaluated by an internal Management Committee in the Catalan Health Service (macromanagement level). Concurrently, each health region team is also involved in limiting the polymedication approach to the needs and priorities for all indicators to be improved (micromanagement level). In case of BHR, and according to the 2008 objectives, this indicator was working at the level of each primary care team or capitation area, and referred to each provider. In such cases of high-risk polymedicated patients, a diagnostic justification was required by the BHR team.

The data collected from the profiles of the polymedicated patients were gender and age. Nine age groups were established (5–14, 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84 and more than 84 years). In terms of drugs consumption, the following were identified: number of prescriptions billed, number of package units dispensed, total cost of medications dispensed and the amount financed by the Catalan Health Service (the total cost of medications dispensed minus the out-of-pocket amount paid by the patients). A package unit is defined as a standard package of a medication dispensed to a patient (prepared by the manufacturers), which does not necessarily coincide with the number of medication units required by the patient. A set of indicators was then obtained: the number of prescriptions per user, the number of package units dispensed per user, the total cost of drugs dispensed per user, the number of prescribers (that prescribed at least one drug) and the level of copayment by the patient at the time of dispensing in the pharmacy.

A descriptive study was conducted simultaneously on the types of drugs prescribed in order to characterise the general therapeutic profile of the study population (number of prescriptions and number of package units dispensed). The drugs were grouped based on the Anatomical-Therapeutic-Chemical Classification System.<sup>23</sup>

### Literature review

A systematic search was conducted (April 2013) through database PubMed to identify the available evidence on the prevalence and medication profile of polymedicated users, as well as the cut-offs indicating multiple drug use. The terms to run the search were located by the vocabulary Medical Subject Headings, with which the articles are indexed in the MEDLINE database. In order to complete this search and extend the results, additional searches combining free terms were also conducted. All search strategies (7) resulted in 2188 references. The studies identified through this search were evaluated by two independent reviewers to assess their inclusion in this document.

### Data analysis

A database was designed. Analysis of variance and Student *t* tests were used to determine the statistical significance ( $p < 0.05$ ) of the differences between population subgroups using the SPSS V.20.0 statistics program.

**Table 1** Polymedicated patients and the number of prescriptions in Barcelona Health Region (BHR) with their monthly changes in 2008

Month (2008)	Users			Monthly evolution (% users)			Prescriptions billed
	Total	Men	Women	Total	Men	Women	
January	8160	2962	5198	31	-7	-7	251 033
February	7407	2659	4748	-9	-10	-9	223 772
March	7029	2578	4451	-5	-3	-6	212 659
April	8136	2864	5272	16	11	18	247 206
May	6470	2270	4200	-20	-21	-20	192 904
June	5691	1995	3696	-12	-12	-12	168 492
July	5553	1976	3577	-2	-1	-3	186 820
August	4034	1437	2597	-27	-27	-27	139 117
September	4396	1528	2868	9	6	10	150 538
October	5631	1986	3645	28	30	27	191 498
November	4762	1699	3063	-15	-14	-16	155 846
December	4525	1635	2840	-5	-4	-7	146 945

Total number of prescriptions billed was 2 266 830.

## RESULTS

### Description of the polymedicated patients

The number of polymedicated patients in BHR in 2008 was 36 880 (0.72% of the total population in BHR) and accounted for 78% of the polymedicated population of Catalonia in 2008; 1 of every 43 filling prescriptions met the criteria for polymedication in BHR. The monthly average of polymedicated patients with these characteristics was 5983±1448. Table 1 shows the total number of polymedicated patients and the number of prescriptions with the 2008 monthly changes (increase or decrease) in BHR.

Table 2 shows the percentage distribution, by gender and age group, of the polymedicated population and the total population in BHR. The average age of the 36 880 patients was 74.5±10.9 years (the full range was 9–108 years) and more than two-thirds of them were women (64.2%). It is noteworthy that 67% of the polymedicated patients were between 65 and 84 years. After individually analysing nine age groups, there appeared to be significant differences in the mean age between

men and women in all age groups ( $p<0.05$ ), except between 25 and 34, 45 and 54, 55 and 64 years.

### Indicators of drug consumption

The total number of prescriptions for polymedicated patients billed to BHR in the year of study was 2 266 830 (2 272 920 total package units; 2 110 290 were drug package units), and the average number of prescriptions dispensed per month was 182 722±36 991. When these items were analysed by age group, the maximum number of prescriptions billed was by patients between 75 and 84 years, the most polymedicated group (up to 40% of the total prescriptions billed). In groups of patients older than 84, the number of prescriptions decreased relevantly.

Overall, the average number of prescriptions billed monthly per patient was 32±2, and the average cost per patient per month was €452.7±27.5. The number of prescriptions billed per patient increased with the age group (up to 45–54 years). After examining the values for the different months, the average rate of increase

**Table 2** Distribution of polymedicated patients and residents in Barcelona Health Region (BHR), by gender and age group

Age group (years)	Users (%)			Population (%)			Difference (%)		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
5–14	0	0	0	9.8	5	4.7	-9.8	-5	-4.7
15–24	0.1	0	0	10.2	5.2	5	-10.1	-5.2	-5
25–34	0.2	0.1	0.2	17.5	9	8.5	-17.3	-8.9	-8.3
35–44	1.1	0.4	0.7	16.6	8.5	8.1	-15.5	-8.1	-7.4
45–54	3.3	1.2	2.1	13.1	6.4	6.7	-9.8	-5.2	-4.6
55–64	11	4.2	6.8	11.1	5.3	5.8	-0.1	-1.1	1
65–74	27.1	10.4	16.7	8.1	3.7	4.4	19	6.7	12.3
75–84	39.9	14.4	25.5	6.1	2.4	3.7	33.8	12	21.8
>84	17.3	5.1	12.2	2.1	0.6	1.5	15.2	4.5	10.7

The "% Users" represents the percentage of polymedicated patients in each age group, followed by gender breakdown, with respect to the total number of polymedicated patients in BHR. The "% Population" represents the percentage of people per age group and by gender with respect to the total population of that region. The 'Difference (%)' is '% Population' subtracted from '% Users' for each age group and by gender.

in billed prescriptions between the age groups (up to 45–54 years) was  $9 \pm 12.3$  prescriptions per patient. However, in age groups above 45–54 years, this rate of increase began to stabilise and started to decrease at a rate of  $-3 \pm 1$  prescriptions billed per patient. The cost per patient followed this same pattern, but the cost started to decrease earlier, starting from the 35–44 age group at a rate of  $\text{€} -70 \pm 29$ /patient.

The number of prescribers that issued at least one prescription varied each month depending on the age and gender of the patients. The monthly average was  $3 \pm 2$  prescribers/patient/month, and 0.3% of patients were prescribed by 10 or more physicians/month. Elderly patients between 65 and 84 ( $p < 0.05$ ) and women ( $p < 0.05$ ) made the greatest number of visits to health-care professionals.

With regard to the copayment level applied to the patient at the time of dispensing, 95.5% of users were exempt from payment (retirees). In 2008, the Catalan Health Service funded 97% of the total cost of medications. BHR accounted for 69% of the drug expenditure in Catalonia; of this percentage, 2% corresponded to the total cost of prescriptions for polymedicated patients in the region.

### Descriptive analysis of medications prescribed for polymedicated patients

The online supplementary appendix 1 shows the distribution of drug use by age groups among polymedicated patients in BHR. Since the range of prescription drugs was widespread, they were classified according to the main anatomical group and therapeutic subgroup to minimise variability and to improve the readability of the results. The five main groups (N, C, A, R and M) represented 71.4% of the total number of drug package units dispensed. Women followed the same pattern as above (group N 15.8%; group C 13.2%; group A 10.8% and group R 5.1% of the total drug package units dispensed). However, in men, group C drugs (8.9% of the total drug package units dispensed) ranked first, followed by groups N and A (7% and 5.9% of the total drug package units dispensed, respectively).

The monthly average of the various active principles dispensed to polymedicated patients in BHR was  $1536 \pm 42$  (peaking in February with 1599 through December with 1476). In general, women had a higher monthly average of prescriptions (different active principles;  $799 \pm 22$ ). The 25 most commonly used active principles by polymedicated men and women in BHR in 2008 represented about 40% of the total drug package units dispensed (40.3% in women and 38.6% in men). The online supplementary appendix 2 shows the full set of results.

Some peculiarities were observed when determining the drugs most frequently prescribed for polymedicated patients; they were differentiated by age group, because the pathologies affecting each population are distinct. In children between 5 and 14 years, nearly 30% of the medications dispensed were losartan, paracetamol and

omeprazole; losartan was the most frequently prescribed medication (9% of all prescriptions in this age group). A change in the consumption patterns of polymedicated patients was observed starting from patients between the ages of 45 and 54, where the number of prescriptions for drugs such as metformin, enalapril, furosemide and aspirin progressively increased. Consumption of group N drugs in users between 65 and 74 years started decreasing to 21.7% of the total medication dispensed, whereas group C drugs started increasing (22.8% of the medication dispensed), turning out to be the most dispensed drugs.

Significant differences were observed between the medication profiles of polymedicated men and women. In men, the two most commonly prescribed drugs were omeprazole and paracetamol, while in women the order was reversed. The most distinguishing feature between men and women was that some chemical subgroups were consumed more by one gender than the other. For example, respiratory drugs were predominant in men, as were antithrombotic agents and vasodilators for coronary disease, such as organic nitrates.

In general, polymedicated patients had a high consumption of anxiolytics, antidepressants, and hypnotics and sedatives, which correspond to 9.4% of the total drug package units dispensed (4.4%, 3.4% and 1.6%, respectively, for each group). Women, who represented 45% of the users of these drugs, simultaneously consumed these three groups of drugs in 2008. Specifically, 80% of women consumed anxiolytics, sedatives or hypnotics, while 61% consumed antidepressants. In contrast, the consumption among polymedicated men was 69% and 42%, respectively, and concurrent use of all three groups of drugs was only 29%.

### DISCUSSION

The cut-off established in this study to determine the number of polymedicated patients in BHR is not commonly used in the published literature available. Regarding the number of active principles dispensed monthly ( $\geq 16$ ), as explained in methods, it is an operational indicator that gives rise to intervention and therefore prioritises that number to influence in that population with potentially greater risk. Besides, due to the volume of data and the subsequent processing and management in the health region, it is unfeasible to consider patients consuming less than this figure. As far as the outcome of consumption is concerned, the number of package units dispensed is the most used indicator by the Catalan Health Service to calculate the total pharmaceutical expenditure of this population and in consequence the impact on the public health budget of BHR.

After a literature review of 2188 references, only 12 of the studies which met the inclusion criteria considered a cut-off of 10 or more drugs, and only one of them followed a similar approach and criteria as ours (polypharmacy



cut-off  $\geq 15$  drugs).<sup>24</sup> In general, many patients receive prescriptions for a large number of drugs, both in our healthcare system and in that of other western countries. Obviously, this situation can be observed more commonly in elderly patients, who require special monitoring, revisions and adjustment of their prescribed medications, for both clinical and expenditure implications.<sup>1</sup>

This study was conducted in BHR due to its size (68% of total population in Catalonia), density of population (1606 inhabitants/km<sup>2</sup>), extension (3179 km<sup>2</sup>) and subsequent high consumption of medicines observed. In addition, population distribution by age and gender is similar in both BHR and Catalonia. This region has the largest number of polymedicated patients in Catalonia, representing 78% of the total polymedicated patients in 2008.<sup>22</sup> Data accumulated by the Catalan Health Service concerning polymedication issues show that the fluctuation in the number of prescriptions follows a seasonal pattern.<sup>25</sup> Throughout the year the number of prescriptions increased in January, June and October, mainly due to visits to physicians before (June) and after (January and October) the holiday period. In addition, the increase in prescriptions in April was due to the annual review of the reference pricing system by the government,<sup>26 27</sup> which reduces the price of drugs from year to year. The new prices came into effect in May and therefore the turnover rate in pharmacies increased (and thus the number of patients and billed prescriptions) in the previous month.

According to published population studies, polymedicated patients are mostly women over 65 with multiple chronic diseases, frequent exacerbations and severe comorbidities, all of which imply a greater consumption of different medications and more frequent visits to health centres to collect prescriptions and/or consult physicians.<sup>10 17 28</sup> Younger and more elderly patients (5–14 and >84 years, respectively) are fewer in number and consume fewer medications with respect to the number of prescriptions and drugs dispensed.<sup>29 30</sup> In contrast, some European studies, such as one by Linjakumpu *et al*<sup>10</sup> in Finland, showed an increased medication consumption in patients over the age of 84.

The data on drugs most commonly used by polymedicated patients in BHR describe their typical medication profile. However, there is great variability in the types of medications these patients consume and it is not minimised when drugs are classified by the therapeutic subgroup. Logically, the most specific classification, that is, classification by chemical substances, will further increase the variability of the medication profile. According to other studies on drug consumption among the general population, the main anatomical groups with the highest consumption are similar to this study (N, C, A, R and M).<sup>31</sup> In polymedicated patients, these five groups accounted for 71.4% of the total package units dispensed. Specifically, omeprazole and paracetamol were the two most frequently consumed drugs (8% in men and 10% in women).

The study shows that consumption of antidepressants, hypnotics and sedatives, and anxiolytics, is a typical indicator of polymedicated patients and is especially significant among women, 45% of whom used at least two of these groups concurrently in 2008. The literature also indicates that the consumption of these drugs is higher among women and can be explained, among others, by their self-perceived poorer state of health and the high prevalence of mental illness and musculoskeletal problems.<sup>32–34</sup>

Despite the importance of polymedication, there is little information on the use of drugs in population subgroups. The majority of previous studies have focused on analysing expenditure by indirectly studying drug consumption based on the amount sold, population health surveys and home medication cabinets.<sup>35 36</sup>

Our study has several limitations. Administrative information systems are not perfect and could limit measurement of data quality in electronic records. This aspect should be taken into account when generalising our results. On the other hand, this study includes a large sample size and provides a way to examine drug use under real-life situations (linked to practice through the prescriber and also to the patient) that potentially increase generalisability. Besides, the information related to prescription rates and costs should be viewed cautiously, as, due to the different forms of presentation and costs of medicines, this information cannot easily be extrapolated to other countries. This would not be the case nationally, as medicines are standardised throughout the whole of Spain. In addition, we did not have access to clinical data, such as medical conditions to determine whether prescribing practices were clinically appropriate.

To conclude, this study provides results concerning the prevalence of polymedicated users in the public healthcare system in Catalonia and shows that the general profile is a woman over 65 with chronic diseases and comorbidities that involve a high consumption of different drugs and thus a higher cost to the healthcare system, in contrast to younger and more elderly patients. This information is essential in order to take steps towards rational drug use and a structured approach in the polymedicated population. These may be practices based and should take into account factors such as age, gender and clinical conditions.

**Contributors** IL-D collected the data, conducted the analysis and wrote the first draft of the manuscript. PM advised on design the study, data analysis and helped revise the draft of the manuscript. PL-C helped in conduct of study and data analysis. CFL helped data analysis and helped revise the draft of the manuscript. AG-P contributed to design the study and expertise in interpretation and analysis. JLS contributed expertise in interpretation and analysis and helped revise the draft manuscript. ELM contributed to design the study, contributed expertise in interpretation and analysis and helped revise the draft manuscript. All authors reviewed and agreed on the submitted version of the manuscript.

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