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Low-value practices in primary care: a cross-sectional study comparing data between males and females in Spain

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ABSTRACT

Introduction Overuse of medical services is a challenge worldwide, posing a threat to the quality of care, patient safety and the sustainability of healthcare systems. Some data suggest that females receive more low-value practices (LVPs)—defined as medical interventions that provide little or no benefit to patients and can even cause harm—than males. This study aims to evaluate and compare the occurrence of LVPs in primary care among both males and females.

Design A retrospective study was conducted.

Setting Primary care in the Alicante province (Spain) during 2022.

Participants Data were extracted from the digital medical records of 978 936 patients attended by 1125 family physicians across 262 primary healthcare centres in the Alicante province.

Outcome measures Data on age, sex, diagnosis and treatment were extracted. The primary outcome measure was the frequency of 12 selected LVPs prescribed to male and female patients. These LVPs were expected to be relatively frequent occurrences with the potential to cause harm.

Results A total of 45 955 LVPs were identified, of which 28 148 (5.27% of 534 603, CI95% 5.20–5.32) were prescribed to female patients and 17 807 (4.00% of 444 333, CI95% 3.95–4.06) to male patients (x^2, p value <0.0001). The most common LVPs were prescribing treatment for overactive bladder without excluding other pathologies that may cause similar symptoms (30.87%), using hypnotics without having a previous aetiological diagnosis in patients with difficulty maintaining sleep (14%) and recommending analgesics (NSAIDs, paracetamol and others) for more than 15 days per month in primary headaches that do not respond to treatment (13.33%).

Conclusions Future clinical training, management and research must consider biological differences or those based on gender factors when analysing the frequency and causes of LVP.

Trial registration number NCT05233852.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study uses a robust dataset from Spain's primary care system, providing updated and specific data on the prevalence of low-value practices.
⇒ A gender-based analysis is incorporated, adding depth to the investigation of low-value practices.
⇒ The study's reliance on electronic health records may lead to under-reporting or misclassification of some low-value practices.
⇒ The findings are based on data from a single healthcare system, which may limit the generalisability to other regions or countries.

INTRODUCTION

The Choosing Wisely campaign, led by the American Board of Internal Medicine Foundation, has successfully engaged a wide range of scientific societies, public and private healthcare institutions, and achieved extensive reach in both developed and developing countries. Its goal is simple: to reduce overuse (overdiagnosis and overtreatment) by emphasising that care should be essential, devoid of harm and evidence based. What initially started as a compendium of 45 recommendations has now expanded to over 600, encompassing all medical specialties. These recommendations aim to reduce the frequency of low-value practices (LVPs), defined as those medical interventions that offer minimal or no benefits to patients, do not improve clinical outcomes, or may even cause harm, while also contributing to the inefficient use of healthcare resources.[1] This campaign holds special relevance in primary care.[2 3]

While the method has been adopted in various countries, the original idea of fostering a dialogue between patients and professionals about overuse has not seen uniform success everywhere. In terms of geographical expansion and impact, Choosing Wisely stands as the most significant initiative to date in reducing overuse, although gaps have been identified in the care of complex patients.[1] The data

on its impact in reducing LVPs varies based on the type of LVP, country, study year and targeted group.[2 4–8] In primary care, the frequency of some identified LVPs in the Choosing Wisely campaign ranges between 16%[9] and 26%.[10]

In Spain, in April 2013, the Ministry of Health approved, on the proposal of the Spanish Society of Internal Medicine (SEMI), the 'Commitment to Quality in Scientific Societies in Spain' to curtail overuse. This initiative, coordinated by the Ministry's Subdirectorate General for Quality and Cohesion, the Aragonese Institute of Health Sciences (with GuíaSalud team participation) and the SEMI, is part of the Spanish Network of Technology and Service Evaluation Agencies of the National Health System's activities. The repository of these recommendations is hosted on the Ministry of Health website.[11] Currently, it comprises 190 recommendations directed at professionals, patients, institutions and health authorities, of which 15 are specific to primary care.[12] Following this model, the Spanish Society of Family and Community Medicine and other autonomous health services have developed additional recommendations to reduce the incidence of LVPs that are still common.

Overuse of medical services studies have not addressed whether gender differences exist in the frequency of LVPs prescribed to men and women, although some studies suggest so. Increased overuse poses a higher risk of adverse events, and in this regard, it appears that women's health may be at greater risk.[13–17] Given this potential for higher risks of adverse events in women, understanding the gender disparities in LVPs is critical to improving patient safety and healthcare efficiency.

This study aims to evaluate and compare the occurrence of LVPs in primary care between males and females. Specifically, it will address the following research question: Are there significant differences between male and female patients in the frequency of LVPs in primary care?

By analysing a set of 12 LVPs identified in Spanish primary care as still relatively common and potentially harmful, this study seeks to contribute to the ongoing efforts to reduce medical overuse and inform future strategies for gender-specific interventions.

METHODS

Design

Retrospective research was conducted with data generated in 2022 in the Spanish primary care setting. The study was based on a review of the complete set of medical records of patients treated in Alicante for a specific period. For this purpose, search algorithms were used to identify predetermined information parameters, such as the prescription of certain medications for diagnoses and conditions specified (online supplemental material 1). The STROBE checklist was used as a guide for reporting the study.[18] The PROSIGA procedure, as named, was used in compliance with local regulations for accessing digital clinical records (DCRs). PROSIGA is an established procedure for extracting data from patients' DCRs in the Valencian Community. This procedure requires that the study protocol be approved by a committee that evaluates the relevance and adequacy of each request, reviews the clarity and functionality of the proposed algorithms (data extraction routines) for automatically extracting data, and ensures that no identifiable personal information is transferred to the database.

Ethics

The Research Ethic Board of the Sant Joan Hospital approved the study protocol. It was registered on ClinicalTrials.gov (NCT05233852).

Setting

The Spanish healthcare system is universal and publicly funded. All citizens and residents are entitled to subsidise access to all medical specialties and medicines with public healthcare coverage. In primary care settings, family physicians have access to digital unique clinical records (DCR) to monitor and prescribe a series of complementary tests and prescriptions for most pathologies. This record provides access to information on diagnoses and associated treatments or tests, including LVPs if they have occurred. The medication prescription is controlled by the healthcare system via DCR and covered by the Spanish public healthcare system, based on the social and economic situation of the patients. Coverage of medication costs is 90% for senior citizens and people in situations of social or labour vulnerability and 60% for the rest of the population. This system assures the registration of all prescriptions and the request for medication and tests. The International Statistical Classification of Diseases and Related Health Problems ICD-10 and the Anatomical Therapeutic Chemical Classification System ATC are used.

Low value practices

The LVPs included in this study were defined as prescription practices by family physicians for which there was consensus that they involved medications or tests of low or no benefit. A total of 12 LVPs were included in this study. For the selection of these LVPs, all LVPs established by the Spanish scientific societies were reviewed. In collaboration with a group of 33 primary care professionals, those LVPs applicable to the primary care setting and to both male and female patients and associated to the prescription of pharmacological treatments were selected. A consensus study involving 40 LVPs was previously conducted to investigate potential differences between men and women in terms of their occurrence and their potential to cause serious adverse events.[19]

The number of LVPs registered was estimated considering the total number of patients who received prescriptions considered as overuse in these LVPs among those patients diagnosed with a specific condition (eg, benzodiazepines prescription for insomnia in patients >65 years: number of patients over 65 years of age with a prescription

of benzodiazepines in 2022 and diagnosed with insomnia previously). They were defined according to the conceptualisation made by the Spanish primary care scientific societies (online supplemental material 1).

Data extraction

Data were extracted from the Abucasis (DCR database used in the public healthcare system in the Valencian autonomous community in Spain) using a set of algorithms (online supplemental material 1). The algorithms used to extract information from DCR included specifications such as age, sex, diagnosis and treatment. These were used to automatically identify the number of cases among the total DCR. The development of these algorithms was undertaken by a group of expert clinicians that evaluated which procedures and treatments could be classified as LVP and the structure of healthcare databases considering the feasibility and reliability of the data extracted. Each algorithm considered the diagnosis and treatment coding used by Spanish healthcare system. This methodology has been used in a previous study.[10]

DCRs included in this study corresponded to patients attended by 1125 family physicians working in 262 primary healthcare centres in the Alicante province (including local centres). The information source included more than 1 700 000 DCRs.

For each DCR, sex and age were recorded. The active diagnostics for patients in the year 2022 were identified using the International Statistical Classification of Diseases (ICD). This classification was used to accurately categorise and retrieve patient records relevant to the study. Similarly, prescribed treatments for the year 2022 were identified following the Anatomical Therapeutic Chemical Classification System (ATC). Both the diagnostic date and prescription date were recorded for each DCR of patients.

Data analysis

The frequency of each LVP was calculated as the ratio between the total number of cases ignoring recommendations and the total number of patients with a prescription or a test. The x^2 test was used to determine the difference between male and female. Statistical significance was set at $p<0.05$. The analysis was performed using Statistical Package for the Social Sciences (SPSS) V.25.0.

RESULTS

For the set of 12 LVPs studied, a total of 45 955 LVPs were identified over the 12-month period. The most common LVPs were prescribing treatment for overactive bladder without excluding other pathologies that may cause similar symptoms (30.87%), using hypnotics without having a previous aetiological diagnosis in patients with difficulty maintaining sleep (14%), and recommending analgesics (NSAIDs, paracetamol, and others) for more than 15 days per month in primary headaches that do not respond to treatment (13.33%) (online supplemental material 2).

Female patients received 28 148 (5.27% of 534 603, CI95% 5.20–5.32) prescriptions not recommended, while male patients received 17 807 (4.00% of 444 333, CI95% 3.95–4.06) (x^2, p value <0.0001).

Statistically, low-value practices exhibited higher prevalence in female patients in the context of the following practices: to use non-steroidal anti-inflammatory drugs (NSAIDs) in individuals with hypertension, heart failure or any cause of chronic kidney disease (CKD) including diabetes; to prescribe proton pump inhibitors (PPIs) as gastroprotection in patients without risk factors for gastrointestinal complications; and the simultaneous use of two or more NSAIDs. Conversely, statistically, to use acetylsalicylic acid for primary prevention in individuals without cardiovascular disease was more prevalent among male patients (online supplemental material 2).

DISCUSSION

Female patients received more LVPs than males. The greatest differences are found in the use of NSAIDs in individuals with hypertension, heart failure or any cause of CKD, including diabetes; prescribing PPIs for gastroprotection in patients without risk factors for gastrointestinal complications; and the simultaneous use of two or more NSAIDs. These data suggest that health risks for women are higher than previously thought, paving the way for studies on the impact of gender and biological differences in examining overutilisation. Additionally, they highlight that the likelihood of experiencing safety incidents is higher among women, as some studies have indicated.[10] The LVPs included in this study are still relatively common in primary care in Spain and share the characteristic of posing a higher risk to patient safety.[16] Therefore, monitoring them to assess the effectiveness of deprescription interventions holds greater significance compared with other LVPs. This study provides a methodology that allows for longitudinal comparisons and can be extended to other healthcare systems.

Defensive medicine, clinical pressure, persistent patient requests, time constraints and lack of awareness regarding recommendations to reduce practices that do not add value to patients are cited as reasons for disregarding these recommendations.[20 21] Some other studies suggest that overutilisation is not widespread and that a minority of professionals (30%) account for the majority of overuse.[9] This, coupled with the effect of women's higher attendance in primary care consultations, should be considered in planning new actions to reduce overuse and in future research.

The more frequent use of NSAIDs in women, despite their cardiovascular risks, could be influenced by several factors, including both patients' and healthcare professionals' perceptions of pain. Studies suggest that women report pain more frequently and more intensely than men, which may lead to higher prescribing rates of analgesics

such as NSAIDs.[22 23] Furthermore, some research indicates that physicians may underestimate pain in male patients compared with females,[24] possibly contributing to this gender difference. These findings underscore the need for greater clinical awareness of the cardiovascular risks associated with NSAID use in women, especially in those with pre-existing risk factors.

The burden of unnecessary testing and treatment is putting both patients and healthcare systems at risk. In this case, women are at higher risk, a factor that should be taken into account by clinicians, planners, managers and academics. It should be considered in training, clinical practice and by decision-makers regarding deprescribing strategies.

The overuse of PPIs in women may be related to gender-specific differences in the perception and reporting of gastrointestinal symptoms such as dyspepsia. Women are more likely to report digestive symptoms, which may be related to both biological factors and a greater tendency to seek medical care.[25 26] Clinicians' perception of women being more susceptible to gastrointestinal complications may also drive the overuse of PPIs in females, even when risk factors are absent. However, it is not merely that women may experience more cases of dyspepsia, but that they tend to report more chronic pain symptoms overall. As PPIs are frequently labelled as 'gastric protectors', many healthcare professionals may be inclined to prescribe them without fully evaluating whether they are necessary or appropriate for the patient's condition.[27] This highlights the importance of applying strict diagnostic criteria for PPI use and taking into account gender differences when managing dyspepsia in clinical practice.

Studies like this one allow us to analyse whether it is necessary to intervene to strengthen messages and actions among professionals and patients to address this issue of overutilisation. Primary care physicians play a significant role in guiding their patients towards adopting healthy behaviours. In line with this work, an objective could be to include deprescription where viable.[28] These actions should be accompanied by providing evidence of the benefits of discontinuing potentially inappropriate medications, benefiting not only patients but also the sustainability of healthcare systems.[2 7] Another aspect to consider is how to address patient demand, which contributes, among other factors, to the persistence of the studied potentially inappropriate medications due to overuse. Some studies suggest that arguments about the impact of unnecessary treatment on patient safety can be more effective than other explanations in shifting patient pressure toward understanding the issue.[29–33] These lines of work require further attention in the future, but they seem suitable in light of preliminary results.

In Spain, as in all countries, the overuse of diagnostic and therapeutic resources poses a significant challenge in providing better patient care. Prior to the Choosing Wisely campaign, despite concerns about overuse, there had not been a comprehensive institutional campaign with broad collaboration among health authorities and scientific societies. Particularly in primary care, there was a strong commitment,[34] leading to various initiatives aimed at sharing information, highlighting the issue of overuse, and conducting studies on its impact on patients and the healthcare system.[34 35]

This study indirectly highlights that the current situation, in terms of the frequency of LVPs, is better than that of 2017, with reductions of up to 39.3% in the frequency of prescribing benzodiazepines for the treatment of insomnia in individuals over 65 years of age in the case of the data from the province of Alicante and the 43.2% in relation to the country as a whole.[10] In Alicante, the frequency of these LVPs had been increasing from 2015 to 2017, then a significant reduction is observed and awareness and aids in prescription by providing alerts that a non-recommended drug could be prescribed for the patient during consultation. Additionally, regarding the prescription of NSAIDs for patients with arterial hypertension, heart failure, chronic kidney disease or hepatic cirrhosis, the data in the province of Alicante from 2015 to 2017 were notably higher compared with the nationwide figures (33.1% vs 7.4%). Therefore, achieving such a significant reduction in 2022 is a positive outcome as well. The reduction of LVPs has received more attention in recent years across all healthcare systems, Spain included (eg, through prescription aids, direct campaigns, or mechanisms to control pharmaceutical spending).[36] However, data do not always indicate a reduction in LVP. At this address, the data is optimistic, indicating a suitable direction in the gradual reduction of overuse. The exception lies in the initiation of treatment for overactive bladder without excluding other pathologies that may cause similar symptoms. This is likely the area where a corrective action should be considered more attentively, such as raising awareness among primary care physicians by leveraging this data.

The data suggests that the dissemination of information about LVPs among primary care physicians in recent years appears to have been successful, affecting males and females similarly. Among the sources of information, two have been the most relevant: the scientific society of family physicians[34] and the campaign by the Spanish Ministry of Health,[11] which several autonomous communities have joined. For instance, in the Valencia community (where this study was conducted), support for prescription interventions in the case of benzodiazepines may have influenced the reduction in the frequency of overuse.

Overuse is one of the causes of the lack of quality care in all health systems and all countries.[37] It concerns the provision of health services in circumstances where the potential risk of harming to patient exceeds the potential benefits.[38] It represents a risk to patient safety[39] and the sustainability of health systems.[40 41] Given that abrupt shifts in overuse trends are unlikely, regular studies monitoring the frequency of LVPs require extended periods to assess their effects. There is a risk that the interpretation attributing the effects directly to campaigns might not be straightforward. Despite their limitations, these

studies are the sole means to comprehend whether initiatives aimed at reducing overuse are truly fulfilling their purpose.

Practical implications

This information can be transformed into automatic alerts in electronic prescription systems to flag LVPs, providing real-time decision support to physicians and serving a dual purpose. On one hand, it offers an educational approach that changes professional habits by making them aware of which LVPs need to be addressed. On the other hand, it reduces the chances of adverse events occurring.

At a clinical level, it is necessary to open a discussion with professionals to identify the pressures, barriers and other factors that limit their ability to reduce LVPs. These may include various elements, such as the lack of information on their impact, as it is often assumed that LVPs do not have negative effects on patients, leading to a 'better safe than sorry' approach. Emphasising the importance of appropriate diagnostic evaluation before prescribing is essential.

This study opens the door to further research to explore gender differences in the prevalence of LVPs and to identify effective interventions for reducing their occurrence.

Limitations

The scope of this study is confined to the province of Alicante. While this territory represents 4.6% of the population in Spain, the data should not be directly generalised to the entire country and may necessitate further analysis. This study was restricted to drugs prescriptions. As data were obtained exclusively from the DCR database used in the public healthcare system, our results might not reflect information that is not documented in this system. The quality of prescriptions was not evaluated. It cannot be conclusively stated that the observed reduction in the frequency of LVPs is solely attributable to the Spanish Commitment to Quality campaign.

CONCLUSIONS

In future clinical training, management and research, it is important to consider biological differences or those based on gender factors in the frequency of overuse.

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Contributors JJM and CC-M contributed equally to this paper and share first authorship. JJM, as the guarantor, accepts full responsibility for the work and the conduct of the study, had access to the data and controlled the decision to publish. JJM, CC-M, AL-P and VP-J conceived and designed the study. CC-M and AL-P were responsible for obtaining funding and ethical approval. CS, VFG-G and MAV aided in the methodological development of the study. JJM and DGT were responsible for data analyses. All authors interpreted data for the work. JJM, AL-P and AS-G prepared the first draft of the manuscript. All authors revised the paper critically for important intellectual content and approved the final version.

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Competing interests The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study does not involve human participants. The Research Ethic Board of the Sant Joan Hospital approved the study protocol (reference N. 21/061). It was registered on ClinicalTrials.gov (NCT05233852).

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Supplemental table S1. List of LVPs and algorithms to estimate frequencies included in the study.

Low-value practice
***Numerator*. All patients over 65 years of age receiving long half-life benzodiazepines** (ATC CODES: N05B, N05BA01, N05BA02, N05BA03, N05BA05, N05BA09, N05BA11, N05BA14, N05BA17) **for chronic insomnia** (ICD-10-ES: G47.0, F51.0, F51.01, F51.02, F51.03, F51.04, F51.05, F51.09, F51.8, F51.9, F51.19) **during 2022**. ***Denominator*. All patients over 65 years of age diagnosed with chronic insomnia** (ICD-10-ES: G47.0, F51.0, F51.01, F51.02, F51.03, F51.04, F51.05, F51.09, F51.8, F51.9, F51.19) **during 2022**.
***Numerator*. In patients with difficulty maintaining sleep** (ICD-10: G47), **to use hypnotics** (ATC CODES: N05C) **without a previous etiological diagnosis during 2022[a].** ***Denominator*. All patients with difficulty maintaining sleep** (ICD-10: G47) **without a previous etiological diagnosis during 2022[a].**
***Numerator*. To use benzodiazepines** (ATC CODES: N05B, N05BA01, N05BA02, N05BA03, N05BA05, N05BA09, N05BA11, N05BA14, N05BA17**) for the treatment of agitation** (ICD-10: R45.1) **or delirium** (ICD-10: R41.0, R41.82, F.22, F.43, F.05, F03.90,1) **in elderly individuals (60 years of age or older) during 2022.** ***Denominator*. All elderly individuals (60 years of age or older) diagnosed with agitation** (ICD-10: R45.1) **or delirium** (ICD-10: R41.0, R41.82, F.22, F.43, F.05, F03.90,1) **during 2022**.
***Numerator*. To recommend analgesics (NSAIDs. paracetamol. and others)** (ATC CODES: M01A, M01AA, M01AB, M01AC, M01AE, M01AG, M01AH, M01AX, M01BA, N02BE01) **for more than 15 days per month in primary headaches** (ICD-10: R51, G44.51, G44.52, G44.53, G44.59, G44.81, G44.82, G44.83, G44.84, G44.85, G44.89, G44.0 y G44.2) **that do not respond to treatment during 2022.** ***Denominator.* All patients with primary headaches** (ICD-10: R51, G44.51, G44.52, G44.53, G44.59, G44.81, G44.82, G44.83, G44.84, G44.85, G44.89, G44.0 y G44.2) **that do not respond to treatment during 2022.**
***Numerator*. To prescribe treatment** (ATC CODES: G04BD) **for overactive bladder** (ICD-10: N39.41 y N32.81) **without excluding other pathologies that may cause similar symptoms during 2022.** ***Denominator*. All patients with overactive bladder** (ICD-10: N39.41 y N32.81) **for whom other pathologies that may cause similar symptoms have not been excluded during 2022.**
***Numerator*. To prescribe opioids** (ATC CODES: N02A) **for acute disabling low back pain** (ICD-10: M54.4-, M54.5) **before evaluating and considering other alternatives during 2022.** ***Denominator*. All patients with acute disabling low back pain** (ICD-10: M54.4-, M54.5) **for whom other alternatives have not been evaluated and considered during 2022.**

Numerator **To use antipsychotics** (ATC CODES: N05A) **for the treatment of Generalized Anxiety Disorder** (ICD-10: F41.1, F41.0, F41.8, F41, F41.3 y F41.9) **in Primary care during 2022.**

Denominator**. All patients diagnosed with Generalized Anxiety Disorder** (ICD-10: F41.1, F41.0, F41.8, F41, F41.3 y F41.9) **in Primary care during 2022.**

Numerator**. To use nonsteroidal anti-inflammatory drugs (NSAIDs)** (ATC CODES: M01A, M01AA, M01AB, M01AC, M01AE, M01AG, M01AH, M01AX, M01BA), **in individuals with hypertension** (ICD-10: I10, I11, I11.0, I11.9, I12, I12.0, I12.9, I13, I13.0, I13.1, I13.2, I13.9, I15, I15.0, I15.1, I15.2, I15.8, I15.9)**, heart failure** (ICD-10: I50, I13.0 y I13.2) **or any cause of CKD** (ICD-10: N18, I12, I12.0, I12.9, I13, I13.0, I13.1, I13.2, I13.9, I13.10, I13.11, I13.13) **including diabetes during 2022.**

Denominator**. All patients with hypertension** (ICD-10: I10, I11, I11.0, I11.9, I12, I12.0, I12.9, I13, I13.0, I13.1, I13.2, I13.9, I15, I15.0, I15.1, I15.2, I15.8, I15.9)**, heart failure** (ICD-10: I50, I13.0 y I13.2) **or any cause of CKD** (ICD-10: N18, I12, I12.0, I12.9, I13, I13.0, I13.1, I13.2, I13.9, I13.10, I13.11, I13.13) **including diabetes** treated **during 2022.**

Numerator**. To prescribe proton pump inhibitors** (ATC CODES: A02B) **as gastroprotection in patients without risk factors for gastrointestinal complications** (ICD-10: K29, K22.1) **during 2022**.

Denominator. All patients without risk factors for gastrointestinal complications (ICD-10: K29, K22.1) treated **during 2022**.

Numerator**. To use two or more nonsteroidal anti-inflammatory drugs (NSAIDs)** (ATC CODES: M01A, M01AA, M01AB, M01AC, M01AE, M01AG, M01AH, M01AX, M01BA) **simultaneously during 2022.**

Denominator**. All patients treated with nonsteroidal anti-inflammatory drugs (NSAIDs)** (ATC CODES: M01A, M01AA, M01AB, M01AC, M01AE, M01AG, M01AH, M01AX, M01BA) **during 2022**.

Numerator**. To use opioids** (ATC CODES: N02A) **as symptomatic treatment for primary headaches** (ICD-10: R51, R51, G44.51, G44.52, G44.53, G44.59, G44.81, G44.82, G44.83, G44.84, G44.85, G44.89, G44.0 y G44.2) **during 2022.**

Denominator**. All patients with primary headaches** (ICD-10: R51, R51, G44.51, G44.52, G44.53, G44.59, G44.81, G44.82, G44.83, G44.84, G44.85, G44.89, G44.0 y G44.2) treated **during 2022.**

Numerator**. To use acetylsalicylic acid** (ATC CODES: B01AC56) **for primary prevention in individuals without cardiovascular disease** (Angina pectoris: I20, I20.0, I20.8, I20.9, I21, I21.0; Acute myocardial infarction: I21.1, I21.2, I21.3, I21.4, I21.9 Subsequent myocardial infarction: I22, I22.0, I22.1, I22.8, I22.9; Complications following acute myocardial infarction: I23, I23.0, I23.1, I23.2, I23.3, I23.4, I23.5, I23.6, I23.8; Other acute ischemic heart diseases: I24, I24.0, I24.1, I24.8, I24.9; Chronic ischemic heart disease: I25, I25.0, I25.1, I25.2, I25.4, I25.5, I25.6, I25.8, I25.9; Ischemic stroke: G45, G45.0, G45.1, G45.2, G45.8, G45.9, G46, G46.0, G46.1, G46.2, G46.3, G46.4, G46.5, G46.6,

G46.7, G46.8, E63, I63.0, I63.1, I63.2, I63.3, I63.4, I63.5, I63.6, I63.8, I63.9, I64, I67.8, I67.9, I69, I69.3, I69.4, I69.8; Hemorrhagic stroke: I61, I61.0, I61.1, I61.2, I61.3, I61.4, I61.5, I61.6, I61.8, I61.9, I69.1; Intermittent claudication: I70.2, I73, I73.8, I73.9) **during 2022.**

***Denominator*. All patients without cardiovascular disease** (Angina pectoris: I20, I20.0, I20.8, I20.9, I21, I21.0; Acute myocardial infarction: I21.1, I21.2, I21.3, I21.4, I21.9 Subsequent myocardial infarction: I22, I22.0, I22.1, I22.8, I22.9; Complications following acute myocardial infarction: I23, I23.0, I23.1, I23.2, I23.3, I23.4, I23.5, I23.6, I23.8; Other acute ischemic heart diseases: I24, I24.0, I24.1, I24.8, I24.9; Chronic ischemic heart disease: I25, I25.0, I25.1, I25.2, I25.4, I25.5, I25.6, I25.8, I25.9; Ischemic stroke: G45, G45.0, G45.1, G45.2, G45.8, G45.9, G46, G46.0, G46.1, G46.2, G46.3, G46.4, G46.5, G46.6, G46.7, G46.8, E63, I63.0, I63.1, I63.2, I63.3, I63.4, I63.5, I63.6, I63.8, I63.9, I64, I67.8, I67.9, I69, I69.3, I69.4, I69.8; Hemorrhagic stroke: I61, I61.0, I61.1, I61.2, I61.3, I61.4, I61.5, I61.6, I61.8, I61.9, I69.1; Intermittent claudication: I70.2, I73, I73.8, I73.9) **treated during 2022.**

Data was segmented by sex and age groups of patients.

[a] In this case, the number of visits was recorded using the patient identification number (SIP).

Supplemental table S2. Frequency of LVPs in primary care.

Low Value Practice (LVP)	Prescriptions considered as overuse/ Total number of patients under a specific condition (LVP prevalence, %)[1]	Prescriptions considered as overuse/ Total number of male patients under a specific condition (LVP prevalence, %)[1]	Prescriptions considered as overuse/ Total number of female patients under a specific condition (LVP prevalence, %)[1]
To administer long half-life benzodiazepines for chronic insomnia treatment in individuals over 65 years old	1833/16100 (11.38)	733/6308 (11.62)	1100/9792 (11.23)
In patients with difficulty maintaining sleep to use hypnotics without a previous etiological diagnosis.	5665/40476 (14.00)	2247/16158 (13.91)	3418/24318 (14.06)
To use benzodiazepines for the treatment of agitation or delirium in elderly individuals.	129/4655 (2.77)	58/1762 (3.29)	71/2893 (2.45)
To recommend analgesics (NSAIDs. paracetamol. and others) for more than 15 days per month in primary headaches that do not respond to treatment.	5489/41186 (13.33)	1670/12343 (13.53)	3819/28843 (13.24)
To prescribe treatment for overactive bladder without excluding other pathologies that may cause similar symptoms.	730/2365 (30.87)	255/870 (29.31)	475/1495 (31.77)
To prescribe opioids for acute disabling low back pain before evaluating and considering other alternatives.	6501/92421 (7.03)	2863/40754 (7.03)	3638/51667 (7.04)
To use antipsychotics for the treatment of Generalized Anxiety Disorder in Primary care.	197/39499 (0.50)	80/13426 (0.60)	117/26073 (0.45)

To use nonsteroidal anti-inflammatory drugs (NSAIDs) in individuals with hypertension, heart failure or any cause of CKD including diabetes.	778/56952 (1.37)	310/27551 (1.13)	468/29401 (1.59)[$]
To prescribe proton pump inhibitors as gastroprotection in patients without risk factors for gastrointestinal complications.	594/6056 (9.81)	186/2163 (8.60)	408/3893 (10.48)[*]
To use two or more nonsteroidal anti-inflammatory drugs (NSAIDs) simultaneously.	15175/4669519 (0.32)	4869/1863305 (0.26)	10306/2806214 (0.37)[#]
To use opioids as symptomatic treatment for primary headaches.	1163/41186 (2.82)	362/12343 (2.93)	801/28843 (2.78)
To use acetylsalicylic acid for primary prevention in individuals without cardiovascular disease.	7701/617075 (1.25)	4174/248574 (1.68)[#]	3527/368501 (0.96)

[1] LVP prevalence was calculated as the ratio between the total number of cases ignoring recommendations ('prescriptions considered as overuse') and the total number of patients with a prescription or a test ('total number of patients under a specific condition'). Prevalences for male and female patients were calculated similarly.

* P-Value <0.05

[$] P-Value <0.01

[#] P-Value <0.001