

STOPP/START Criteria in Patients with Type 2 Diabetes Mellitus in Colombia: A Cross-Sectional Study

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Abstract

Purpose

Type 2 diabetes mellitus (T2DM) is a high-burden disease that requires complex treatment. The aim was to determine the prevalence of potentially inappropriate medications and therapeutic omissions by applying the Screening Tool of Older Person's Prescriptions (STOPP)/Screening Tool to Alert to Right Treatment (START) criteria in patients with T2DM in Colombia.

Methods

A cross-sectional study of patients with a new diagnosis of T2DM who were treated between July-2023 and June-2024 was performed. The STOPP/START criteria were applied to identify potentially inappropriate medications and therapeutic omissions. Multivariate analyses were performed.

Results

A total of 434 patients were included; 54.1% were women, with a median age of 71.0 years (IQR:67.0–76.0). The most frequent comorbidities were hypertension (84.6%), dyslipidemia (68.7%) and obesity (35.0%). The most commonly used antidiabetic agent was metformin (84.6%). The most common comedications were lipid-lowering drugs (89.6%) and antihypertensives (85.4%). A total of 71.7% of patients met the STOPP/START criteria, with a prevalence of 51.8% for the STOPP criteria and 47.5% for the START criteria. The inappropriate use of acetylsalicylic acid in primary prevention (15.9%) and the omission of proton pump inhibitors among users of nonsteroidal anti-inflammatory drugs (18.7%) were highlighted. Patients with rheumatologic comorbidities were more likely to present the STOPP (OR:4.07; 95%CI:2.41–6.89) or START (OR:2.77; 95%CI:1.72–4.44) criteria.

Discussion

The high prevalence of the STOPP/START criteria in this population indicates significant opportunities to improve the quality of prescribing in older adults with T2DM, particularly in patients with a greater burden of comorbidities and exposure to multiple medications.

1. Introduction

Type 2 diabetes mellitus (T2DM) is a chronic disease of high global impact and is characterized by persistent hyperglycemia secondary to insulin resistance and progressive deterioration of its secretion, which increases the risk of microvascular and macrovascular complications [1, 2]. Its incidence continues to increase, with more than 529 million adults affected in 2021, which is projected to increase to more than 1,300 million by 2050 [3]. It is estimated that 81.0% of patients live in low- and middle-income countries [4]. In Colombia, according to estimates by the International Diabetes Federation, approximately 3 million adults live with T2DM, which places the country in third place in South and Central America in terms of the number of cases [4]. According to the High Cost Account of Colombia, the prevalence is 4.4%, with differences between the different geographical regions of the country [5]. In addition, 16.2% of cases are estimated to remain undiagnosed, highlighting major challenges in timely detection, metabolic control and comprehensive treatment approaches [4]⁴. The World Health Organization has reported that more than half of people

living with T2DM are not receiving pharmacological treatment, and this number is greater in low- to middle-income countries [2].

Potentially inappropriate prescriptions are common in older adults and in those with multiple comorbidities in addition to T2DM because of the therapeutic complexity required to control glycemia, blood pressure, lipids and other concomitant conditions [1, 6, 7]. Potentially inappropriate prescriptions are associated with an increased risk of adverse events, hospitalizations and lower therapeutic adherence, which deteriorates health outcomes and increases the costs associated with care [7, 8]. In this context, the Screening Tool of Older Person's Prescriptions (STOPP) and Screening Tool to Alert to Right Treatment (START) criteria have emerged as evidence-based tools to optimize pharmacotherapy by identifying potentially inappropriate medications and therapeutic omissions, respectively [9]. The application of these criteria has been shown to reduce adverse events, improve the quality of prescribing and favor shared clinical decisions in geriatric and primary care settings [8, 10].

The inappropriate use of medications in Colombia is a frequent problem of clinical relevance [11, 12]. However, information on the prevalence of potentially inappropriate prescriptions and therapeutic omissions in patients with T2DM is lacking. The available evidence has focused mainly on general geriatric populations or on specific conditions—such as dementia, glaucoma, prostatic hyperplasia, constipation or infections—without a focus on patients with T2DM in the outpatient setting [11, 12]. This absence of data limits decision-making on the basis of the national epidemiological context and hinders the implementation of strategies aimed at the rational and appropriate use of medications adjusted to the needs of the Colombian health system. The objective of this study was to evaluate the prevalence of potentially inappropriate drug prescriptions and therapeutic omissions by applying the STOPP/START criteria in patients with T2DM in Colombia.

2. Materials and Methods

2.1. Study design and patients

A cross-sectional observational study in which the STOPP/START criteria were applied to patients with a confirmed diagnosis of T2DM was carried out. The cases were identified from a population database of drug dispensing administered by the pharmaceutical manager Audifarma SA, which consolidates information from approximately nine million members of the Colombian health system. Patients affiliated with the Salud Total EPS-S insurer, which serves approximately 3.9 million people in most regions of the country who belong to both the contributory regime (85.0%) and the subsidized regime (15.0%), were included. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [13].

Patients were identified using the codes of the International Classification of Diseases, tenth revision (ICD-10), that correspond to diabetes mellitus (E100–E149). Confirmed cases and newly diagnosed cases of T2DM registered between July 1, 2023, and June 30, 2024, were included. Eligible individuals were 65 years of age or older and of any sex and city of residence. Patients without available clinical information, without continuous records of drug dispensing by the pharmaceutical manager, with dispensations of antidiabetic drugs during the previous year, or without a report of serum creatinine that prevented the calculation of the glomerular filtration rate were excluded.

2.2 Variables

The data of the patients were obtained from two sources of information: 1) A drug dispensing database (Audifarma SA) that allowed the collection of data on sociodemographic variables (e.g., sex, age, origin, and affiliation regime) and pharmacological variables (e.g., medication type and pharmaceutical form); and 2) clinical records that allowed data collection of clinical variables (e.g., vital signs, anthropometric measurements, diagnosis and complications of diabetes

mellitus, and comorbidities) and laboratory variables (e.g., levels of glycated hemoglobin and creatinine, the urinary albumin/creatinine ratio, and levels of hemoglobin, potassium, sodium and vitamin D). With the information collected, the STOPP/START criteria in version 3 were applied [9]. The different variables and the origin of the data are shown in Supplementary Table 1.

2.3 Sample size

The sample size was estimated using the program Epidat version 4.2, considering a population of 5,297 patients, an error of 5%, a confidence level of 95% and an expected proportion of 50%. With these parameters, it was determined that 358 participants were needed. To improve the accuracy of the estimates and the statistical power, 434 patients were ultimately included. The selection was made by simple random sampling.

2.4 Data analysis

The data were analyzed with the statistical package SPSS Statistics, version 26.0 for Windows (IBM, USA). A descriptive analysis was performed using absolute and relative frequencies for the qualitative variables, as well as measures of central tendency (median) and dispersion (interquartile range, IQR) for the quantitative variables having a nonparametric distribution according to the Kolmogorov–Smirnov test. No imputation of missing data was performed. Comparisons of quantitative variables were performed using the Mann–Whitney U test, and comparisons of categorical variables were performed through the X^2 test or Fisher's exact test.

Exploratory multivariate analyses were performed using binary logistic regression. The dependent variables were the proportion of patients with the STOPP criteria (yes/no) and the proportion of patients with the START criteria (yes/no). Candidate independent variables (covariables) for the logistic regression were those that showed statistical significance with the dependent variable in the bivariate analyses, as well as those with sufficient reported plausibility (e.g., age, sex, comorbidities, and polypharmacy). The intro method was used to select the variables. Adjusted odds ratios (ORs) with 95% confidence intervals are presented. A level of statistical significance of $p < 0.05$ was established. Multicollinearity between the predictors was analyzed using the tolerance values and the variance inflation factor (VIF). The calibration of the model was evaluated using the Hosmer–Lemeshow goodness of fit test. The discriminative capacity was evaluated by estimating the area under the curve–receiver operating characteristic (AUC–ROC).

3. Results

Sociodemographic characteristics

A total of 434 participants with a confirmed diagnosis of T2DM were included (Fig. 1). A total of 54.1% ($n = 235$) of the participants were women, and the median age was 71.0 years (IQR: 67.0–76.0 years). The patients came from 34 different municipalities or cities, mainly from the central region, and were affiliated with the contributory regime of the country's health system (Table 1).

Clinical characteristics

A total of 43.3% ($n = 188$) of patients had micro or macrovascular complications, mainly chronic kidney disease ($n = 140$; 32.3%), coronary atherosclerotic disease ($n = 52$; 12.0%), ischemic cerebrovascular disease ($n = 19$; 4.4%), peripheral arterial disease ($n = 8$; 1.8%), peripheral neuropathy ($n = 4$; 0.9%), carotid disease ($n = 1$; 0.2%) and gastropathy ($n = 1$; 0.2%). The median glycated hemoglobin level was 6.7% (IQR: 6.5–7.2). The most frequent comorbidities were hypertension ($n = 367$; 84.6%), dyslipidemia ($n = 298$; 68.7%) and obesity ($n = 152$; 35.0%). Grouping comorbidities, namely, cardiovascular ($n = 378$; 87.1%), endocrine ($n = 359$; 68.7%) and rheumatologic ($n = 123$; 28.3%)

comorbidities prevailed. Among the hypertensive patients, 86.6% (n = 318/367) had blood pressure < 130/80 mmHg. Comorbidities, vital signs, anthropometric measurements and complementary studies are shown in Table 1.

Pharmacological characteristics

The median number of medications that patients received was 4.9 (IQR: 3.6–6.7), and 48.8% (n = 212) received 5 or more medications. The majority of patients were managed with metformin (n = 367; 84.6%), and the most frequent comedications were lipid-lowering agents (n = 389; 89.6%) and antihypertensives (n = 370; 85.4%) (Table 2).

STOPP/START criteria characteristics

A total of 71.7% of patients (n = 311; 95% CI: 67.4%–75.9%) presented at least one STOPP/START criterion. A total of 51.8% of patients (n = 225; 95% CI: 47.1%–56.6%) presented the STOPP criteria, especially the use of acetylsalicylic acid in primary prevention (n = 69; 15.9%). On the other hand, 47.5% of patients (n = 206; 95% CI: 42.7%–52.2%) presented the START criteria, especially the omission of proton pump inhibitors (PPIs) among users of anti-inflammatory drugs and nonsteroidal drugs (NSAIDs) (n = 81, 18.7). A total of 27.6% (n = 120) presented the STOPP and START criteria simultaneously, with 24.2% (n = 105) only presenting the STOPP criteria and 19.8% (n = 86) presenting only the START criteria. The main STOPP/START criteria identified in this group of patients are detailed in Table 3.

Multivariate analysis

Binary logistic regression revealed that the presence of cardiovascular, rheumatological or neurological comorbidities, higher levels of glycated hemoglobin and polypharmacy were associated with a greater probability of meeting the STOPP criteria (Table 4). The values of tolerance (range: 0.874–0.971) and the VIF (range: 1.030–1.152) ruled out the presence of multicollinearity between the explanatory variables. Similarly, the Hosmer–Lemeshow test (p = 0.856) indicated adequate calibration of the model, and its discriminative capacity was acceptable, with an AUC-ROC of 0.765 (95% CI: 0.721–0.809). With respect to the model for the START criteria, rheumatologic and respiratory comorbidities were associated with a higher probability of their presence, whereas female sex was associated with a lower probability (Table 5). The tolerance values (range: 0.851–0.955) and VIFs (range: 1.047–1.175) indicated the absence of multicollinearity. The Hosmer–Lemeshow test (p = 0.734) confirmed the adequate calibration of the model, and the discriminative capacity was acceptable, with an AUC-ROC of 0.693 (95% CI: 0.644–0.743).

4. Discussion

The present study determined the prevalence and characterized the STOPP/START criteria in a group of older adults with T2DM who were treated in a middle-low income Latin American country. A high frequency of these criteria was observed, particularly in patients with certain chronic comorbidities and polypharmacy. Evidence related to the application of the STOPP/START criteria in low- and middle-income countries is still limited, especially in Latin America [6]. In this context, the findings provide relevant information on prescription patterns and allow the identification of potential intervention opportunities for optimizing the use of medications in this population and reducing the risk of associated adverse outcomes [8–10].

The predominance of females was consistent with that reported in studies conducted in Saudi Arabia and China (54.1% vs. 52.0–62.0%) [14, 15], although it differed from the findings described in Canada and some European countries, where males predominated (51.0% and 55.8–56.4%, respectively) [16, 17]. Similarly, the ages of the patients were similar to those reported in other studies (71.0 years vs. 68.0–74.0 years) [14, 16–18]. The high burden of comorbidities and the presence of complications were also frequent findings and are consistent with the findings of other studies based on real-world evidence [14, 15, 19]. The prevalence of polypharmacy was comparable to that observed in Bulgaria

and China (48.8% vs. 54.4–55.6%) [15, 20] but was considerably lower than that described in the United Kingdom (77.8%), Saudi Arabia (84.0%) and Canada (91.2%) [14, 16, 19]. Advanced age, the coexistence of multiple comorbidities and polypharmacy highlight the complexity of the clinical management of this population and the challenges associated with the appropriate prescription of medications [8, 10, 21–23].

A total of 71.7% of patients presented at least one STOPP/START criterion, a proportion similar to that reported by Milushewa et al. in Bulgaria, who used the same criteria in older adults with T2DM (66.0%) [20]. Other studies have reported prevalences of potentially inappropriate prescriptions between 24.9% and 78.0%; however, they used the Beers criteria [14–17, 19, 24]. The lowest prevalence was observed in the Netherlands (24.9%) [24] and the United Kingdom (32.3%) [16], while the highest rates were recorded in Scotland (78.0%) [17] and Canada (56.1%) [19]. These variations could be attributable to differences in the characteristics of the populations studied, health care environments, health systems, availability of medications, prescription patterns and habits, and the instruments and versions used to identify potentially inappropriate or inappropriate prescriptions and omitted prescriptions [14–17, 19, 20, 24].

The most prevalent STOPP criterion identified in this study was the use of acetylsalicylic acid for primary prevention (15.9%), a finding consistent with a pharmacoepidemiological study conducted in Colombia, in which the frequent use of this antiplatelet agent in patients with T2DM was documented (44.2–57.5%) [25]. In contrast, a study developed in Bulgaria identified the use of acetylsalicylic acid as the most frequent STOPP criterion in patients with a history of peptic disease without concomitant treatment with PPIs (9.8%) [20]. Recent evidence indicates that although acetylsalicylic acid may be associated with a modest reduction in the risk of atherothrombotic cardiovascular events in certain groups of patients, this benefit is usually limited and may be affected by an increase in the risk of adverse events, particularly gastrointestinal bleeding and intracranial bleeding [26, 27]. In this context, the United States Preventive Services Task Force (USPSTF) does not recommend the use of acetylsalicylic acid for primary prevention in individuals over 60 years of age [28].

The most frequent START criterion in this study was the omission of PPI prescriptions in patients receiving NSAIDs. In contrast, in a study conducted in Bulgaria, the most prevalent START criterion corresponded to the absence of antiplatelet therapy in patients with a history of atherosclerotic disease (10.5%) [20]. The indication of PPIs in patients treated with NSAIDs, particularly those with gastrointestinal risk factors, such as advanced age, a history of peptic ulcer or the concomitant use of anticoagulants, antiaggregants or corticosteroids, has been shown to decrease the risk of gastroduodenal ulcers and associated complications, including hemorrhage and gastrointestinal perforation [29–31]. However, although PPIs have a generally favorable safety profile, their administration (mainly prolonged) has been associated with possible adverse effects, including an increased risk of chronic kidney disease, acute kidney injury, osteoporotic fractures, hypomagnesemia and gastrointestinal and respiratory infections, among others [31–33]. Consequently, the indication of gastroprotection with PPIs must be individualized and supported by an adequate assessment of the balance between benefits and potential risks [30, 31].

Some variables were associated with the presence of the STOPP/START criteria. In particular, the increase in the number of drugs prescribed was related to a greater probability of presenting with the STOPP criteria, a finding consistent with that reported in previous studies [14, 15, 19]. Similarly, the presence of neurological, rheumatological and cardiovascular comorbidities was associated with an increased risk of presenting with the STOPP criteria, whereas the presence of rheumatological and respiratory comorbidities was related to a greater probability of presenting with the START criteria; these results are consistent with those described in the literature [14, 15, 17, 19]. These associations could be explained by the fact that patients with multiple chronic diseases often require more complex therapeutic schemes and a greater number of medications, which increases both the risk of potentially inappropriate prescriptions and the omission of clinically indicated treatments [21–23]. In addition, polypharmacy increases the complexity of

therapeutic management and promotes the emergence of pharmacological interactions, therapeutic duplication, adverse events, clinical inertia and poor adherence to treatment [21, 23].

When interpreting the results of this study, several limitations should be considered. First, the included patients belonged to a single insurance entity of the Colombian health system, which could restrict the extrapolation of the findings to other populations; however, the sample included people from all regions of the country. Second, the information was obtained from drug dispensing records and clinical records; thus, the data could be affected by recording errors, underreporting or incomplete information, and limitations inherent to the use of secondary sources. Third, although the dispensation database allowed the identification of the medications claimed by the patients, it does not make it possible to confirm their consumption, adherence to the prescribed treatment or the use of medications acquired through their own resources. Fourth, the application of the STOPP/START criteria depended on the availability and quality of the information contained in the clinical records, which could have limited the identification of some criteria. Finally, owing to the cross-sectional design of the study, it is not possible to establish causal relationships between the covariables evaluated and the presence of the STOPP/START criteria; therefore, the ORs should be interpreted only as measures of association, and their findings require confirmation by longitudinal studies.

5. Conclusions

The findings of the present study revealed that older adults with T2DM had a high burden of comorbidities and a high frequency of polypharmacy, highlighting the clinical and therapeutic complexity of this population. The prevalence of the STOPP/START criteria was high and was present in more than two-thirds of patients, especially in those with cardiovascular, neurological, rheumatological and respiratory comorbidities, as well as in those receiving more than five concomitant medications. Among the most frequent criteria were the use of acetylsalicylic acid for primary prevention and the omission of PPIs in patients treated with NSAIDs. The identification of the STOPP/START criteria provides potentially useful information to guide clinical interventions and drug optimization programs aimed at strengthening the safety and appropriateness of pharmacological treatment in older adults with T2DM.

Declarations

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Declaration of competing interest: All authors declare no conflict of interest.

Ethics approval: The protocol was approved by the Research Ethics Committee of the Technological University of Pereira in the category of "research without risk", according to scientific standards (endorsement code: 127-201123). The ethical principles established by the Declaration of Helsinki were followed.

Consent to participate. No applicable, is a retrospective observational study.

Consent to publish: all authors consent to participate

Availability of data and material: [protocols.io](https://www.protocols.io)

Code availability: <https://www.protocols.io/private/1F3CFBF9A7CB11F1A1CB0A58A9FEAC02>

Tables

Table 1
Sociodemographic, clinical, and laboratory characteristics of patients with
type 2 diabetes mellitus in Colombia

Variables	n = 434	%
Sociodemographics	-	-
Female	235	54,1
Age (years), median (IQR), n = 434	71.0 (67.0–76.0)	
Origin. n = 434	-	-
Central Region	139	32.0
Caribbean Region	105	24.2
Bogotá-Cundinamarca Region	88	20.3
Eastern Region	78	18.0
Pacific Region	24	5.5
Health insurance affiliation. n = 434	-	-
Contributory	319	73.5
Subsidized	115	26.5
Comorbidity. n = 434	-	-
Hypertension	367	84.6
Dyslipidemia	298	68.7
Obesity	152	35.0
Chronic kidney disease	140	32.3
Osteoarthritis	93	21.4
Hypothyroidism	78	18.0
Atherosclerotic cardiovascular disease	75	17.3
Benign prostatic hyperplasia	74	17.1
Cancer	40	9.2
Chronic obstructive pulmonary disease	34	7.8
Anthropometric measurements. median (IQR)	-	
Weight (kg). n = 433	72.0 (64.0-81.5)	
Body mass index (kg/m ²). n = 433	28.3 (25.2–31.3)	
Vital signs. median (IQR)	-	
Systolic blood pressure (mmHg). n = 434	120.0 (115.0-130.0)	
Diastolic blood pressure (mmHg). n = 434	78.0 (70.0–80.0)	
IQR: Interquartile Range; eGFR: estimated Glomerular Filtration Rate		

Variables	n = 434	%
Mean arterial pressure (mmHg). n = 434	91.7 (85.3–96.7)	
Heart rate (beats/min). n = 434	76.0 (70.0–80.0)	
Respiratory rate (breaths/min). n = 433	18.0 (16.0–19.0)	
Temperature (°C). n = 412	36.0 (36.0–36.5)	
Laboratory findings. median (IQR)	-	
Glycated hemoglobin (%). n = 430	6.7 (6.5–7.2)	
Hemoglobin (g/dL). n = 266	14.0 (12.9–15.0)	
Hematocrit (%). n = 266	42.0 (38.7–45.0)	
Potassium (mEq/L). n = 254	4.3 (4.0–4.6)	
Sodium (mEq/L). n = 25	140.0 (135.5–142.0)	
Urinary albumin/creatinine ratio (mg/g). n = 362	10.7 (5.2–22.3)	
Creatinine (mg/dL). n = 434	0.91 (0.78–1.10)	
GFR (mL/min/1.73 m ²). n = 434	76.4 (61.9–89.9)	
Vitamin D (ng/mL). n = 25	27.2 (21.3–33.5)	
IQR: Interquartile Range; eGFR: estimated Glomerular Filtration Rate		

Table 2

Antidiabetic and concomitant pharmacological therapy received over one year in patients with type 2 diabetes mellitus in Colombia.

Drugs	n = 434	%
Mean number of medications. n = 434		
< 5 medications	222	51.2
5–9 medications	198	45.6
≥ 10 medications	14	3.2
Antidiabetic treatment. n = 434	-	-
Biguanides	367	84.6
SGLT2 inhibitors	166	38.2
DPP4 inhibitors	112	25.8
Long-acting insulins	13	3.0
GLP-1 receptor agonists	11	2.5
Short-acting insulins	4	0.9
Sulfonylureas	1	0.2
Co-medications. n = 434	-	-
Lipid-lowering agents	389	89.6
Antihypertensives	370	85.3
Analgesics and anti-inflammatories	290	66.8
Antiulcer drugs	165	38.0
Antithrombotic agents	132	30.4
Antihistamines	76	17.5
Thyroid hormone	75	17.3
Antiepileptics	70	16.1
Bronchodilators and inhaled corticosteroids	58	13.4
Antidepressants	49	11.3
SGLT2: Sodium–Glucose Cotransporter 2; DPP-4: Dipeptidyl Peptidase-4; GLP-1: Glucagon-Like Peptide-1		

Table 3
Application of STOPP/START Criteria in patients with type 2 diabetes mellitus in Colombia

Drugs	n = 434	%
Screening Tool of Older Persons' Prescriptions (STOPP Criteria)		
Aspirin for primary prevention in cardiovascular disease	69	15.9
Any duplicate drug class prescription for daily regular use	46	10.6
First-generation antihistamines as first-line treatment for allergy or pruritus	40	9.2
Long-term opioids for osteoarthritis	32	7.4
Loop diuretic as first-line treatment for hypertension unless there is concurrent heart failure requiring diuretic therapy	31	7.1
Corticosteroids (other than periodic intra-articular injections for mono-articular pain) for osteoarthritis	20	4.6
NSAID's if eGFR < 50 ml/min	12	2.8
Long-term systemic i.e.. non-topical NSAIDs with known history of coronary. cerebral or peripheral vascular disease	11	2.5
Drugs likely to cause constipation with chronic constipation where non-constipating alternatives are available	8	1.8
NSAID's with severe hypertension i.e.. systolic blood pressure consistently above 170 mmHg and/or diastolic blood pressure consistently above 100 mmHg	7	1.6
Use of oral or transdermal strong opioids as first line therapy for mild pain	7	1.6
Concomitant use of two or more drugs with antimuscarinic/anticholinergic properties	7	1.6
Centrally-acting antihypertensives	6	1.4
Aldosterone antagonists with concurrent potassium-conserving drugs without monitoring of serum potassium	6	1.4
Long-acting muscarinic antagonists with a history of narrow angle glaucoma or bladder outflow obstruction	6	1.4
Screening Tool to Alert to Right Treatment (START Criteria)		
Proton pump inhibitor with short-term (< 2 weeks) or longer-term (> 2 weeks) NSAID.	81	18.7
Laxatives in patients receiving opioids regularly	47	10.8
Selective alpha-1 receptor blocker for lower urinary tract symptoms related to benign prostatic hyperplasia	35	8.1
Antiplatelet therapy with a documented history of coronary. cerebral or peripheral vascular disease.	18	4.1
Bone anti-resorptive or anabolic therapy in patients with documented osteoporosis and/or previous history of fragility fracture (s)	13	3.0
NSAID: Nonsteroidal Anti-inflammatory Drug; eGFR: estimated Glomerular Filtration Rate; COPD: Chronic Obstructive Pulmonary Disease; GOLD: Global Initiative for Chronic Obstructive Lung Disease; SNRI: Serotonin–Norepinephrine Reuptake Inhibitor; SSRI: Selective Serotonin Reuptake Inhibitor; ACE: Angiotensin-Converting Enzyme; CKD: Chronic Kidney Disease		

Drugs	n = 434	%
Beta-blocker with symptomatic coronary artery disease	12	2.8
Long-acting muscarinic antagonist or long-acting beta 2 agonist for symptomatic COPD of GOLD 1 or 2 severity and chronic asthma	12	2.8
Proton Pump Inhibitor with severe gastro-oesophageal reflux disease or peptic oesophageal stricture requiring dilatation	10	2.3
Selective serotonin reuptake inhibitor (or SNRI or pregabalin if SSRI contraindicated) for persistent severe anxiety	9	2.1
ACE inhibitor or Angiotensin Receptor Blocker in diabetes with evidence of renal disease unless evidence of severe CKD (eGFR < 30 ml/min/m ²).	9	2.1
Angiotensin Converting Enzyme inhibitor with coronary artery disease	7	1.6
Osmotic laxative for chronic persistent idiopathic or secondary benign constipation	7	1.6
Cardio-selective beta-blocker for stable heart failure with reduced ejection fraction	5	1.2
Acetylcholinesterase inhibitor for mild-moderate Alzheimer's dementia	5	1.2
Vitamin D in patients with known osteoporosis and/or previous fragility fracture(s) and/or Bone Mineral Density T-scores below - 2.5 in one or multiple sites	5	1.2
NSAID: Nonsteroidal Anti-inflammatory Drug; eGFR: estimated Glomerular Filtration Rate; COPD: Chronic Obstructive Pulmonary Disease; GOLD: Global Initiative for Chronic Obstructive Lung Disease; SNRI: Serotonin–Norepinephrine Reuptake Inhibitor; SSRI: Selective Serotonin Reuptake Inhibitor; ACE: Angiotensin-Converting Enzyme; CKD: Chronic Kidney Disease		

Table 4

Multivariable logistic regression analysis of factors associated with STOPP (Screening Tool of Older Person's Prescriptions) criteria in a group of patients with type 2 diabetes mellitus. Colombia.

Variables	Crude OR	95% CI		p-value	Adjusted OR	95% CI		p-value
		Lower	Upper			Lower	Upper	
Female (yes/no)	1.517	1.037	2.217	0.032	1.089	0.699	1.696	0.707
Age (continuous)	1.036	1.006	1.066	0.017	1.017	0.982	1.053	0.336
Origin: Bogotá–Cundinamarca region (yes/no)	1.022	0.640	1.632	0.928	1.367	0.796	2.349	0.258
Cardiovascular comorbidities (yes/no)	2.133	1.191	3.820	0.011	2.384	1.140	4.988	0.021
Rheumatological comorbidities (yes/no)	4.204	2.630	6.719	< 0.001	4.077	2.412	6.890	< 0.001
Digestive comorbidities (yes/no)	1.674	1.059	2.647	0.028	1.202	0.700	2.064	0.505
Neurological comorbidities (yes/no)	3.579	1.903	6.732	< 0.001	3.424	1.662	7.054	0.001
Psychiatric comorbidities (yes/no)	3.000	1.316	6.837	0.009	1.573	0.617	4.010	0.343
Glycated hemoglobin (continuous)	1.061	0.933	1.207	0.365	1.176	1.011	1.367	0.035
Glomerular filtration rate < 60 mL/min (yes/no)	1.630	1.021	2.604	0.041	1.477	0.840	2.596	0.175
< 5 medications	Reference	Reference	Reference	< 0.001	Reference	Reference	Reference	< 0.001
5–9 medications	3.110	2.055	4.709	< 0.001	2.728	1.712	4.347	< 0.001
≥10 medications	4.318	2.101	8.872	< 0.001	4.179	1.824	9.577	0.001
OR: Odds Ratio; CI: Confidence Interval								

Table 5

Multivariable logistic regression analysis of factors associated with START (Screening Tool to Alert to Right Treatment) criteria in a group of patients with type 2 diabetes mellitus. Colombia.

Variables	Crude OR	95% CI		p-value	Adjusted OR	95% CI		p-value
		Lower	Upper			Lower	Upper	
Female (yes/no)	0.603	0.412	0.882	0.009	0.453	0.296	0.694	< 0.001
Age (continuous)	1.014	0.986	1.043	0.334	1.007	0.974	1.041	0.695
Origin: Bogotá–Cundinamarca region (yes/no)	1.348	0.843	2.155	0.212	1.249	0.746	2.093	0.398
Cardiovascular comorbidities (yes/no)	0.695	0.395	1.222	0.207	0.778	0.408	1.483	0.446
Rheumatological comorbidities (yes/no)	2.362	1.537	3.628	< 0.001	2.770	1.725	4.448	< 0.001
Digestive comorbidities (yes/no)	1.371	0.874	2.149	0.169	1.226	0.747	2.012	0.420
Respiratory comorbidities (yes/no)	3.385	1.736	6.599	< 0.001	3.676	1.762	7.665	0.001
Psychiatric comorbidities (yes/no)	1.680	0.808	3.495	0.165	1.471	0.648	3.339	0.356
Glycated hemoglobin (continuous)	1.039	0.915	1.179	0.557	1.043	0.909	1.197	0.548
Glomerular filtration rate < 60 mL/min (yes/no)	0.992	0.627	1.570	0.973	0.762	0.447	1.300	0.319
< 5 medications	Reference	Reference	Reference	0.634	Reference	Reference	Reference	0.837
5–9 medications	1.110	0.738	1.640	0.638	1.122	0.719	1.751	0.611
≥ 10 medications	1.377	0.706	2.686	0.348	1.202	0.561	2.572	0.636
OR: Odds Ratio; CI: Confidence Interval								

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Figures

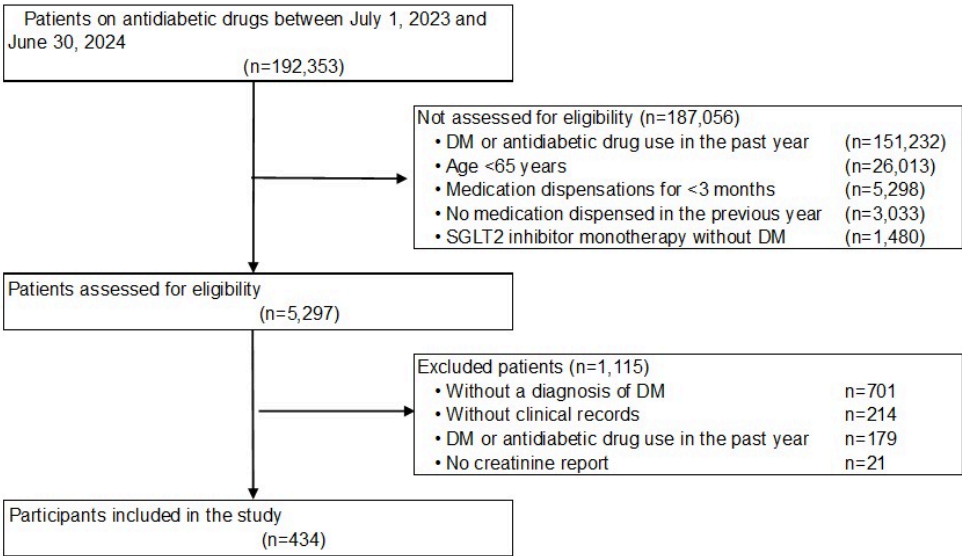


Figure 1. Study flow gram

Figure 1

Study flow gram

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