



# Patterns of inappropriate prescribing and clinical characteristics in patients at admission to an acute care of the elderly unit

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## Abstract

**Purpose** Inappropriate prescribing (IP) is common among the elderly and is associated with adverse health outcomes. The role of different patterns of IP in clinical practice remains unclear. The aim of this study is to analyse the characteristics of different patterns of IP in hospitalized older adults.

**Methods** This is a prospective observational study conducted in the acute care of elderly (ACE) unit of an acute hospital in Barcelona between June and August 2021. Epidemiological and demographic data were collected, and a comprehensive geriatric assessment (CGA) was performed on admitted patients. Four patterns of inappropriate prescribing were identified: extreme polypharmacy (10 or more drugs), potentially inappropriate medications (PIMs), potential prescribing omissions (PPOs) and anticholinergic burden.

**Results** Among 93 admitted patients (51.6% male, mean age of 82.83), the main diagnosis was heart failure (36.6%). Overprescribing patterns (extreme polypharmacy, PIMs, PPOs and anticholinergic burden) were associated with higher comorbidity, increased dependence on instrumental activities of daily living (IADL) and greater prevalence of dementia. Underprescribing (omissions) was associated with important comorbidity, residence in nursing homes, an increased risk of malnutrition, higher social risk and greater frailty. Comparing different patterns of IP, patients with high anticholinergic burden exhibited more extreme polypharmacy and PIMs. In the case of omissions, no association was identified with other IP patterns.

**Conclusions** We found statistically significant association between patterns of inappropriate prescribing and clinical and CGA variables such as comorbidity, dependency, dementia or frailty. There is a statistically significant association between patterns of overprescribing among patients admitted to the ACE unit.

**Keywords** Inappropriate prescribing · Polypharmacy · Anticholinergic burden · Elderly · Comprehensive geriatric assessment · Frailty

## Introduction

The ageing of the population has resulted in an increased multimorbidity of the elderly, closely related to polypharmacy. Inappropriate prescribing is common in the elderly and is associated with polypharmacy, and both situations are implicated in adverse health outcomes [1–5]. In addition, patients with advanced age and multimorbidity are at increased risk of being prescribed

anticholinergic drugs, which increases the risk of cognitive and functional impairment, falls, hospitalization and death [6–9].

There is no universal definition of polypharmacy, but the most widespread definition refers to the presence of 5 or more medications, with extreme polypharmacy defined as the presence of 10 or more medications [1]. In the case of anticholinergic burden, several scales measure exposure to these drugs, each with its advantages and disadvantages, and there is no consensus on which is the most accurate one [10].

The prevalence of polypharmacy ranges from 7 to 45% among community-dwelling elderly [10, 11]. In Spain, the prevalence of polypharmacy among community-dwelling elderly is as high as 27.3%, with those over 80 years of age experiencing the most significant percentage increase in polypharmacy (3.4%) over a 10-year study period. In addition, up

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to 50% of the elderly are prescribed anticholinergic/sedative drugs, which may consequently worsen their functional or cognitive capacity [10].

Numerous studies highlight the increased prevalence of inappropriate prescribing in the elderly across community, hospital and residential settings. Inappropriate prescribing encompasses both overprescribing (potentially inappropriate prescribing of medicines (PIM), anticholinergic burden) and underprescribing (potentially omitted prescribing (PPO)) [12–20]. A study in our setting showed that in over half of the cases, both problems were present simultaneously [18].

The role of different patterns of inappropriate prescribing in clinical practice remains ill-defined. Little is known about the ability to predict negative outcomes resulting from the combination of polypharmacy, potentially inappropriate medication (PIMs and PPOs) or anticholinergic burden because previous studies have predominantly focused on individual patterns [21, 22].

The aim of this study is to analyse the clinical characteristics of different patterns of inappropriate prescribing and the association between them, prior to admission to an acute care of the elderly (ACE) unit.

## Materials and methods

### Study design

This is a prospective observational study conducted in the ACE unit of the Sant Rafael acute hospital, a collaborating centre of the Vall d'Hebron Hospital in Barcelona city. The hospital currently provides a 24-bed ACE unit, distributed across three clinical teams. Data was obtained from the medical records of admitted patients to one of these three teams between June 2021 and August 2021.

### Study population

We include in our ACE unit all patients from Barcelona northern area, requiring hospital admission for acute medical illness or exacerbation of chronic pathology. The recommended admission criteria was as follows: individuals aged 75 and above, categorized as frail and pre-frail (FRAIL score > 0), with no significant baseline dependence in daily activities of living (Barthel Index > 60), and lacking severe baseline cognitive impairment (global deterioration scale (GDS)-Reisberg < 6).

### Methods

Four patterns of inappropriate prescribing were defined: extreme polypharmacy, PIMs, PPOs and high anticholinergic burden.

Inappropriate prescribing pattern definitions were as follows:

- Extreme polypharmacy: 10 or more medications
- Potentially inappropriate medication (PIM), focusing on the central nervous system with the Screening Tool of Older Persons' Prescriptions (STOPP-CNS or group D), using STOPP/START version 2 [23]
- Potential prescribing omissions (PPO) focusing on the cardiovascular group with the Screening Tool to Alert to Right Treatment (START-CV or group A), using STOPP/START version 2
- High anticholinergic burden using the DBI (drug burden index) [24]

We examined the clinical history and compiled epidemiological and demographic data, encompassing factors such as age, gender, origin, main diagnoses upon admission, length of stay and discharge destination. The assessment of baseline status, concerning specific variables, involved a thorough evaluation of frailty (using the FRAIL scale) [25], basic and instrumental activities of daily living (measured by the Barthel Index and Lawton Index, respectively) [26, 27], cognitive function (measured by the GDS-Reisberg) [28], multimorbidity (Charlson comorbidity index) [29] and geriatric syndromes, including dementia diagnosis at admission, social risk (medical records), dysphagia (medical records), risk of malnutrition with the Short Nutritional Assessment Questionnaire (SNAQ) [30], risk of falls (history of more than one fall in the last year confirmed in the medical history or during the interview) and risk of pressure ulcers (Norton scale) [31]. Within the initial 48 h of admission, cognitive status was assessed using the Pfeiffer test, and the risk of delirium was assessed with the 4AT delirium assessment tool [32, 33].

Comprehensive geriatric assessment (CGA) was performed by the hospital geriatrics team, whilst the evaluation of inappropriate prescribing was facilitated by the hospital pharmacy team.

### Statistical analysis

The sample was analysed using the average and standard deviation for continuous variables. Frequencies and percentages were used for categorical variables. To compare between subgroups in the present study, the Student's *t*-test was used for continuous variables. To compare the results of the categorical variables, the  $\chi^2$  was applied. When the result was less than 5, Fisher's test was indicated. The statistically significant value was 0.05.

## Results

A total of 93 patients were included, of whom 48 (51.6%) were male, with a mean age of 82.83 (SD 7.53). Eighty-two (88.2%) came from home, and the main diagnosis at admission was heart failure in 34 (36.6%) of patients. Length of stay was 8.46 (SD 5.37). The mean of FRAIL was 2.92 (SD 1.23). Most patients exhibited high comorbidity (Charlson index 3.3, SD 2.27). In addition, they showed slight dependence for basic and instrumental activities of daily living. The mean number of drugs at admission was 11.75 (SD 4.71), and 64 (68.8%) patients had extreme polypharmacy. Thirty-nine (42.0%) of patients had one or more STOPP criteria of group D, and 43 (46.3%) of patients had one or more START criteria of group A. Forty-one (44.1%) of patients had high anticholinergic burden. The baseline characteristics of the study population are summarized in Table 1.

We observed differences in the clinical profiles of admitted patients based on two types of inappropriate prescribing: firstly, the overprescribing group characterized by polypharmacy, PIMs and anticholinergic burden, and secondly, the underprescribing group marked by PPOs.

In the first group, patients with extreme polypharmacy exhibited more comorbidity, with a statistically significant difference (3.64 vs 2.55,  $p=0.046$ ). Patients with one or more STOPP criteria in group D were more dependent for instrumental activities of daily living (IADL) (Lawton Index 3.49 vs 4.72,  $p=0.042$ ) and had a higher diagnosis of dementia than those without criteria. A total of 16 (41%) 6 (11.1%) of patients with one or more STOPP criteria had dementia, compared to 6 (11.1%) of patients without STOPP criteria. They also had a higher likelihood of being discharged home compared to those without such criteria (82.1% vs 68.5%,  $p=0.023$ ). No statistically significant differences were found for the presence of comorbidity, dependence or other geriatric syndromes when analysing anticholinergic burden.

Within the underprescribing group, patients with one or more START criteria exhibited higher comorbidity (3.91 vs 2.78,  $p=0.016$ ) and were at higher risk of malnutrition (55.8% vs 32.0%,  $p=0.023$ ) and social risk (37.2% vs 12.0%,  $p=0.004$ ). Patients with one or more START criteria were more frail: 36 (83.7%) of patients with omissions were frail, compared to 29 (59.1%) of those without omissions, with a statistically significant difference. We found also that patients with one or more START criteria were from nursing homes or intermediate care hospitals more than those without START criteria (23.2% vs 2.0%,  $p=0.009$ ). Among the four patterns of inappropriate

**Table 1** Baseline demographics and clinical characteristics

Measures	Total: 93 patients
Age, y, mean (SD)	82.83 (7.53)
Gender, male, <i>n</i> (%)	48 (51.6)
Length of stay, days, mean (SD)	8.46 (5.37)
Main diagnosis, <i>n</i> (%)	
Heart failure	34 (36.6)
COPD	14 (15.1)
Origin at admission, <i>n</i> (%)	
Home	82 (88.2)
Others*	9 (11.8)
Destiny at discharge, <i>n</i> (%)	
Home	61 (65.6)
Others**	32 (34.4)
FRAIL score, mean (SD)	2.92 (1.23)
GDS, mean (SD)	2.32 (1.26)
Dementia, <i>n</i> (%)	22 (23.7)
Barthel Index, mean (SD)	76.56 (19.23)
Lawton Index, mean (SD)	4.18 (2.80)
Charlson Index, mean (SD)	3.3 (2.27)
Number of medications, mean (SD)	11.75 (4.71)
Polypharmacy, <i>n</i> (%)	
5 and more	86 (92.5)
10 and more	64 (68.8)
STOPP-D (1+), <i>n</i> (%)	39 (42.0)
START-A (1+), <i>n</i> (%)	43 (46.3)
DBI high, <i>n</i> (%)	41 (44.1)

SD standard deviation, COPD chronic obstructive pulmonary disease, GSD global deterioration scale, DBI drug burden index

\*Others: nursing homes, intermediate hospital, other hospitals

\*\*Others: nursing homes, intermediate hospitals, other hospitals, hospital-at-home (HaH), death

prescribing, there were no statistically significant differences in terms of risk of falls, delirium, dementia, risk of pressure ulcers or dysphagia. These results are summarized in Appendix 1. Summary of the significant results are shown in Table 2.

Analysis of the four patterns of inappropriate prescribing mentioned above, we observed differences in the group of overprescribing. In cases involving extreme polypharmacy and PIMs, both groups also displayed a high anticholinergic burden with a statistically significant difference: 34 (53.1%) of patients with extreme polypharmacy had a high anticholinergic burden, with a statistically significant difference. Of the group of patients with one or more STOPP criteria, 23 (59%) had a high anticholinergic burden. In the case of omissions, no association was identified with other inappropriate prescribing patterns. Results are shown in Table 3.

Table 2 Clinical patterns of inappropriate prescribing

	Polypharmacy			STOPP-D (1+)			Anticholinergic burden			START-A (1+)		
	10+	<10	<i>p</i>	1+	0	<i>p</i>	High	Without	<i>p</i>	1+	0	<i>p</i>
	<i>n</i> (%)	<i>n</i> (%)		<i>n</i> (%)	<i>n</i> (%)		<i>n</i> (%)	<i>n</i> (%)		<i>n</i> (%)	<i>n</i> (%)	
<b>FRAIL scale, mean (SD)</b>	3.02 (1.17)	2.69 (1.13)	<i>p</i> =0.265	2.90 (1.35)	2.92 (1.14)	<i>p</i> =0.920	2.82 (1.03)	2.98 (1.36)	<i>p</i> =0.946	3.3 (1.0)	2.57 (1.27)	<i>p</i> =0.003
<b>Lawton Index, mean (SD)</b>	4.47 (2.71)	3.59 (2.95)	<i>p</i> =0.181	3.49 (2.91)	4.72 (2.62)	<i>p</i> =0.042	4.05 (2.74)	4.29 (2.87)	<i>p</i> =0.549	3.90 (2.52)	4.42 (3.03)	<i>p</i> =0.384
<b>Charlson Index, mean (SD)</b>	3.64 (2.1)	2.55 (2.49)	<i>p</i> =0.046	2.95 (1.76)	3.56 (2.57)	<i>p</i> =0.206	3.29 (1.89)	3.31 (2.56)	<i>p</i> =0.559	3.91 (2.14)	2.78 (2.28)	<i>p</i> =0.016
<b>Dementia, <i>n</i> (%)</b>	16 (25.0)	6 (20.7)	<i>p</i> =0.623	16 (41)	6 (11.1)	<i>p</i> <0.001	13 (31.7)	9 (17.3)	<i>p</i> =0.116	12 (27.9)	10 (20.0)	<i>p</i> =0.337
<b>Malnutrition risk, <i>n</i> (%)</b>	25 (39.1)	15 (51.7)	<i>p</i> =0.588	17 (43.6)	23 (42.6)	<i>p</i> =0.582	16 (39.0)	24 (46.2)	<i>p</i> =0.624	24 (55.8)	16 (32.0)	<i>p</i> =0.023
<b>Social risk, <i>n</i> (%)</b>	13 (20.3)	9 (31.0)	<i>p</i> =0.260	10 (25.6)	12 (22.2)	<i>p</i> =0.702	10 (24.4)	12 (23.1)	<i>p</i> =0.882	16 (37.2)	6 (12.0)	<i>p</i> =0.004
<b>Origin at admission, <i>n</i> (%)</b>	57 (89.1)	25 (86.2)	<i>p</i> =0.896	35 (89.7)	47 (87.0)	<i>p</i> =0.664	36 (87.8)	46 (88.5)	<i>p</i> =0.431	33 (76.7)	49 (98.0)	<i>p</i> =0.009
<b>Home</b>	3 (4.7)	2 (6.9)		2 (5.1)	3 (5.6)		1 (2.4)	4 (7.7)		5 (11.6)	0 (0.0)	
<b>Nursing home</b>	4 (6.3)	2 (6.9)		2 (5.1)	4 (7.4)		4 (9.7)	2 (3.8)		5 (11.6)	1 (2.0)	
<b>Others*</b>												
<b>Destiny at discharge, <i>n</i> (%)</b>	47 (73.06)	22 (75.9)	<i>p</i> =0.377	32 (82.1)	37 (68.5)	<i>p</i> =0.023	30 (73.1)	39 (75.0)	<i>p</i> =0.395	29 (67.5)	40 (80.0)	<i>p</i> =0.220
<b>Home**</b>	17 (26.5)	7 (24.1)		7 (17.9)	17 (31.5)		11 (26.8)	13 (25.0)		14 (32.6)	10 (20.0)	
<b>Others***</b>												

*SD* standard deviation, *STOPP-D* STOPP criteria of group D or central nervous system, *START-A* START criteria of group A or cardiovascular system, Anticholinergic burden is measured as high or low/without risk with drug burden index

\*Others: intermediate hospital, other hospital

\*\*Home: own home, nursing home or hospital-at-home (HaH)

\*\*\*Others: intermediate hospital, other hospital, death

**Table 3** Relation between different patterns of inappropriate prescribing

	Polypharmacy		STOPP-D (1+)		Anticholinergic burden (high)		START-A (1+)		<i>p</i>
	10+	<10	1+	0	High	Without	1+	0	
Polypharmacy, <i>n</i> (%)	27 (42.2)	12 (41.4)	27 (69.2)	37 (68.5)	34 (82.9)	30 (57.7)	31 (72.1)	33 (66.0)	<i>p</i> =0.527
STOPP-D (1+), <i>n</i> (%)	34 (53.1)	7 (24.1)	23 (59.0)	18 (33.3)	23 (56.1)	16 (30.8)	16 (37.2)	23 (46.0)	<i>p</i> =0.942
Anticholinergic burden (high), <i>n</i> (%)	31 (48.4)	12 (41.4)	16 (41.0)	27 (50.0)	19 (46.3)	24 (46.2)	19 (44.2)	22 (44.0)	<i>p</i> =0.004
START-A (1+), <i>n</i> (%)									<i>p</i> =0.260
									<i>p</i> =0.527
									<i>p</i> =0.986

STOPP-D STOPP criteria of group D or central nervous system. START-A START criteria of group A or cardiovascular system. High anticholinergic burden with drug burden index

## Discussion

In this study, we found that the most important factors associated with inappropriate prescribing depend on the clinical profile of the patients studied. Patients with extreme polypharmacy exhibit more comorbidity. Those with STOPP criteria of group D demonstrate increased dependence on instrumental activities of daily living and higher prevalence of dementia. Patients with one or more STOPP criteria had a higher likelihood of being discharged home compared to those without such criteria. Finally, patients with START criteria in group A were non-dwelling, more frail, with higher comorbidity, higher social risk and higher risk of malnutrition compared to those without such criteria. When analysing patterns of inappropriate prescribing, we found that patients with high anticholinergic burden had more extreme polypharmacy and more STOPP criteria, with no findings on clinical variables related to this pattern. In the case of omissions, no association was identified with other inappropriate prescribing patterns. A statistically significant association was identified among extreme polypharmacy, potentially inappropriate medications (PIMs) of group D of STOPP/START criteria and high anticholinergic burden in patients admitted to the acute care of the elderly unit. Conversely, no statistically significant association was found between the PPOs of group A of STOPP/START criteria with the three other profiles analysed.

A study conducted by Alshammari et al. showed that the strongest predictor of potentially inappropriate prescribing is polypharmacy, followed by Alzheimer’s disease, depression, irritable bowel syndrome, hypothyroidism and chronic kidney disease [34]. This confirms that inappropriate prescribing patterns are influenced by factors associated with comorbidity, frailty and the presence of cognitive impairment, which is consistent with our patient group. The findings of our study highlight the importance of understanding prescribing patterns to assess the risk of inappropriate prescribing of each patient.

Our results are consistent with other research, such as the study conducted by Meid et al. on omissions using the START criteria of the cardiovascular group or group A. They reported a high prevalence of omissions, with noted association between omissions and frailty [35]. Gutiérrez-Valencia et al. in their investigation did not observe an association between frailty and polypharmacy in multivariate analysis. However, they found more START criteria in frail patients, with a tendency towards a higher rate of omissions in frail patients living in nursing homes [36]. In our series, patients with omissions were also from nursing homes or intermediate care hospitals. More of them, however, did not have advanced frailty or dependency

for basic activities of daily living. Additionally, they did not present advanced dementia that could justify a more palliative approach to comorbidities. Our findings align with other studies that have reported a similar association between common PPO and older patients, particularly those with cardiovascular diseases such as heart failure or ischaemic heart disease [35, 37, 38]. Few studies have explored the clinical predictors linked to both overprescribing and underprescribing conditions. Limited data exist that establish a relationship between these two variables, with one notable exception being a study conducted in our setting. In this particular study, the prevalence of inappropriate prescribing was reported to be 87.6%, and notably, 54.3% of patients simultaneously exhibited PIM and underprescribing (PPO) [18]. Regarding anticholinergic burden, our series showed an association between high anticholinergic burden and extreme polypharmacy with a statistically significant difference. This finding was also corroborated with STOPP criteria of group D. There were no statistically significant differences in terms of age, comorbidity, frailty, functionality or dementia between patients with high anticholinergic burden and those with low anticholinergic burden, as has been reported in other studies [10, 39, 40].

In the same way that there is a lack of literature evaluating different patterns of inappropriate prescribing (IP), there is less literature about interventions to improve adverse health effects. There are several studies with interventions in different healthcare settings. A recent clinical trial involving frail older adults without advanced cognitive impairment demonstrated that interventions promoting pharmacological deprescribing could effectively reduce PIMs at 6 months following. However, this reduction was not sustained at 12 months, nor did it translate into a decrease in hospitalizations [41]. In the OPERAM study, the researchers evaluated the effect of a pharmacotherapy optimization intervention in older patients with multimorbidity and polypharmacy. They successfully reduced potentially inappropriate prescribing without observing any impact on drug-related hospital admissions during a 12-month follow-up period. [42].

A systematic review found positive outcomes related to medication review in frail older people, although only in two of the 25 studies were analysed [43]. Another systematic review exploring deprescribing in frail individuals revealed some evidence of positive effects on clinical outcomes such as function, frailty, cognitive status and depression. This review found that mortality and hospitalization rates did not increase after interventions [44]. In our setting, a study carried out within an integrated health intervention in primary care, focusing on polypharmacy and inappropriate prescribing (IP) in the elderly, indicates sustained improvements in inappropriate prescribing even 6 months after the intervention. Moreover, individuals who experienced a reduction in

the STOPP criteria during the intervention demonstrated not only a decrease in polypharmacy but also a reduction in falls by the end of the intervention [6]. Authors in the field emphasize the importance of adopting an individualized and multidisciplinary approach, identifying individuals at higher risk for adverse outcomes of polypharmacy. It is noteworthy that there is no conclusive evidence suggesting that the number of medications, rather than inappropriate prescribing, is directly responsible for these adverse outcomes. Potentially inappropriate prescribing is particularly problematic when patients are discharged from hospital. One study found that at least one third of patients have IP at discharge [45]. This is an important moment in drug therapy management, offering an opportunity to proactively prevent inappropriate prescribing and provide support for follow-up care transitions. They also recommend tight communication and collaboration between healthcare settings to ensure a safe transition of care [46, 47]. A recent systematic review underlines the importance of that interventions, strategies and tools designed to minimize iatrogenic risks for multimorbid older patients by reducing the number of drugs they consume. The reviewers considered three main recommendations in implementing measures to improve appropriateness: prescription, acceptance by the patient and continuous monitoring of adherence and risk–benefit profile [48]. Implementing such measures is crucial for achieving meaningful improvements in medications management for the older population with multiple comorbidities.

The available literature which examines the adverse outcomes of polypharmacy in the elderly is complex, extensive and unclear. Most of the studies only consider polypharmacy itself with a diverse range of medications and disease profiles. These studies neglected considerations of inappropriate prescribing [49]. Therefore, the present study is important as it demonstrates the necessity for a different approach to the assessment of inappropriate prescribing. It highlights the importance of developing suitable interventions according to the clinical profile of the patient, aiming to improve prescribing and reduce adverse health events. Further investigations are needed to analyse the different patterns of inappropriate prescribing and their relationship with different items of the CGA. Such studies would be able to provide clinical and prognostic differences among patients based on the specific patterns they exhibit.

The present study boasts strengths in its innovative approach, establishing associations between different patterns of inappropriate prescribing and other clinical and drug prescription variables unique of each patient. Additionally, the application of comprehensive geriatric assessment as part of the evaluation for inappropriate prescribing is also noteworthy. However, it is important to acknowledge the limitations of this study, including a small sample size and a single-centre setting, which implies that the



findings may not be extrapolated to the general population. Another limitation is the utilization of an abbreviated form of the STOPP/START criteria, focusing our attention on potentially inappropriate medications affecting the central nervous system and potentially prescribing omissions related to the cardiovascular system.

## Conclusions

In the present study, we found an association between different patterns of inappropriate prescribing and clinical and CGA characteristics of admitted patients. There is an association between patterns of overprescribing and dependency and dementia, whilst underprescribing was associated with frailty, risk of malnutrition and social risk. Both patterns of inappropriate prescribing are associated with comorbidity. We also found an association between extreme polypharmacy, PIMs and anticholinergic burden with no association with PPOs, with a statistically significant difference.

Inappropriate prescribing is a complex challenge in older adults, and further investigation is needed to elucidate the different patterns of IP and their relationship with clinical characteristics. These investigations are likely to improve outcomes in both hospitalized and community-dwelling older adults. The present study demonstrated the importance of a CGA to identify different risks associated with inappropriate prescribing.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s00228-024-03627-3>.

**Author contribution** M.Z. wrote the entire manuscript and all the authors reviewed the manuscript.

**Availability of data and materials** The data that support the findings of this study are available upon reasonable request from the corresponding author.

## Declarations

**Ethical approval** This is a prospective observational study that has the approval of the Ethics Committee of Vall d'Hebron Hospital and adheres to the Declaration of Helsinki (1964) and its later amendments (current version dating from 2013).

**Consent to participate** All patients provided informed consent to participate in this study.

**Consent for publication** All patients provided informed consent that their patient-related data may be used for publications.

**Competing interests** All authors declare that they have no financial conflicts of interest.

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