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Prescriptive adherence to GINA guidelines and asthma control: An Italian cross sectional study in general practice

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Prescriptive adherence to GINA guidelines and asthma control: an Italian cross sectional study in general practice.

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Key words: cross sectional study, asthma, allergic rhinitis, drug prescriptions, adherence, GINA guidelines, control

Abstract

Background: Although general practitioners (GPs) are frequently the first healthcare professionals whom asthma patients refer to for their symptoms, few studies have explored the extent of adherence to guidelines for asthma management based on data provided directly by GPs.

Aims of the present study were to assess drug prescriptions for asthma by GPs and to evaluate prescriptive adherence to GINA guidelines (GL) and its relationship with disease control in real life.

Methods: 995 asthmatic patients (45% males, mean age 43.3 ± 17.7 yrs) were enrolled by 107 Italian GPs distributed throughout the country. Data on diagnosis, disease severity, prescribed anti-asthmatic drugs and control were collected through questionnaires filled out by GPs taking into consideration the 2009 GINA Guidelines. Data on drug use and chronic sinusitis, nasal polyposis, chronic bronchitis, emphysema were reported by patients through a self-administered questionnaire.

Results: The large majority of patients were classified by GPs as having intermittent (48.4%) or mild persistent asthma (25.3%); 61% had co-morbid allergic rhinitis (AR). The prevalent therapeutic regimen used by patients was a combination of inhaled corticosteroids (ICS) plus long-acting β_2-agonists (LABA) (54.1%), even in the intermittent/mild persistent group. ICS as mono-therapy or in combination with other drugs but LABA, was the second most frequently adopted treatment (14.4%). In general, the GPs adherence to GL treatment indications was 28.8%, with a significant association with a good asthma control (OR 1.85, 95% CI 1.18-2.92). On the other hand, comorbidity (OR 0.52, 95% CI 0.32-0.84), moderate (0.44, 0.28-0.69) and severe

(0.06, 0.02-0.20) persistent asthma showed significant negative effects on asthma control.

Conclusions: Our results show that over-treatment of intermittent/mild persistent asthma is frequent in the GPs setting while therapeutic regimens are more appropriately applied for moderate/severe asthma. In general, we found low adherence to GINA GL treatment recommendations even if its relevance in asthma control was confirmed.

List of abbreviations

AIFA: The Italian Medicines Agency

AR: Allergic Rhinitis

ARGA study: Italian acronym for '*Allergopatie Respiratorie: studio di monitoraggio delle linee guida GINA e ARIA'*, i.e. Respiratory allergies: monitoring study of GINA and ARIA guidelines

GARD: Global Alliance Against Chronic Respiratory Diseases

GINA: Global Initiative for Asthma

GL: guidelines

GPs: General Practitioners

ICS: Inhaled Corticosteroids

LABA: Long-acting β_2-agonists

LTRA: Leukotriene receptor antagonists

SABA: Short-acting β_2-agonists

SCS: Systemic Corticosteroids

Introduction

Asthma is a chronic inflammatory condition of the lower airways that represents a serious global burden. In Europe asthma affects about 30 million children and adults under 45 yrs of age, with a prevalence in northern and western countries among adults aged 18-44 ranging from 3% to more than 9% [1]. Asthma is increasing to epidemic proportions due to the persistence and rise of most common risk factors such as atopic predisposition, exposure to indoor and outdoor environmental pollution (including occupational exposure), viral infections and obesity.

In Italy, the prevalence of people experiencing current asthma attacks has more than doubled during the past 25 yrs [2]. Asthma also leads to a lower quality of life, lower productivity and increasing medical costs [3]. In Italy, asthma prevalence is about 8% among the general population [2], 8.9% among young adults [4], and 9.5% and 10.4% among children and adolescents, respectively [5].

The correct evidence-based management of asthmatic patients should be ensured by following international guidelines (GL) such as those published under GINA (Global Initiative for Asthma), one of the founding participants in the World Health Organization's Global Alliance against chronic Respiratory Diseases (GARD). However, studies report that GL recommendations often aren't applied in clinical practice [6, 8]. Difficulties in the implementation of GL in clinical practice may be caused by different factors such as GL complexity, poor doctor-patient communication, structural limitations of the Health Systems, lack of incentives, treatment duration, patients' misuse of prescribed medications, low expectations and aspirations about the achievable degree of control [9]. As a consequence, asthma may be either under-treated or over-treated.

Asthma and allergic rhinitis (AR) often coexist. Associations between these two conditions have been demonstrated and it is currently considered that AR and asthma represent a continuum of the same disease [10]. Several studies identified AR as a risk factor for asthma, with the prevalence of AR in asthmatics being 80% to 90% [11]. In Italy, about 60% of asthmatics reported allergic rhinitis [4]

Although asthma and allergic rhinitis burden is high among general population and general practitioners (GPs) are the healthcare professionals whom patients firstly refer to for their symptoms, to date there are only few studies concerning asthma management based on data directly provided by GPs.

The general aim of the ARGA study (Italian acronym for '*Allergopatie Respiratorie: studio di monitoraggio delle linee guida GINA e ARIA'*, i.e. Respiratory allergies: monitoring study of GINA and ARIA guidelines), funded by the Italian Medicines Agency (AIFA, Italian acronym for '*Agenzia Italiana del Farmaco'*), was to monitor the extent of application of GINA [12] and ARIA [10] guidelines for asthma and allergic rhinitis in real life clinical practice.

Specific aims of this study were: 1) to assess drug prescription for asthma by General Practitioners in patients with asthma only or with asthma and rhinitis; 2) to evaluate prescriptive adherence to GINA GL according to asthma severity and its impact on asthma control.

Methods

Study design

The ARGA study included subprojects related to four research areas: A. observational studies, B. drug surveillance, C. educational intervention, and D. prescription appropriateness and pharmaco-economics. It involved 10 Units from various Italian institutions: National Research Council (CNR), National Institute of Health (ISS), Medical Institutes for Hospital Admission Care and Research (IRCCS), Universities and Local Health Services. The current paper reports GPs data on diagnosis, disease severity level, control and anti-asthmatic drug prescriptions to asthmatic patients participating in the cross sectional study "Observational study on Italian General Practitioners" (area A) in 2007-2008.

Population

GPs, working for the Italian National Health Service, were randomly chosen from a list of GPs participating in previous epidemiological studies. A hundred and seven GPs (89% of expected; 79% males) accepted to participate in the study after an invitation by mail and, subsequently, by phone. GPs were invited to select and to recruit by phone all their asthmatic patients taking anti-asthmatic drugs or with asthma symptoms in the last 12 months. Male and female Italian citizens aged 14 yrs and over were considered eligible subjects. Subjects deemed unable to collaborate in the survey, and those permanently hospitalized or living in nursery homes were excluded. Participating patients provided *ex ante* written informed consent for the purposes of the study: participation in the study by filling out a self-administered questionnaire,

anonymous management of individual data and collective and anonymous publication of the research results.

The study protocol, along with all the related documents, were approved by the Ethic Committee of University-Hospital of Pisa (*Azienda Ospedaliero-Universitaria Pisana*) on October 13, 2006 (Prot. no. 37710 of October 25, 2006).

Data collection

For each recruited asthmatic patient, GPs filled-out an ad hoc questionnaire to gather information on diagnosis, disease severity, disease control and prescribed drugs for asthma. Patients themselves provided information on use of any other drug and chronic sinusitis, nasal polyposis, chronic bronchitis, emphysema through a self administered questionnaire .

In the current study, asthma diagnosis and level of severity were derived from the following questions:

1. 'What kind of diagnosis have you made for your patient?' (allergic rhinitis, asthma or both);
2. If asthma, 'Have you assessed the severity level of asthma of your patients?' (yes, no);
3. If yes, 'What is the diagnosed severity level of asthma?' (intermittent, mild persistent, moderate persistent, severe persistent [12]).

A patient was classified as having *asthma* according to diagnosis and/or asthma severity level as reported by GPs. GPs reported the control of symptoms (poor, partial, good, optimal) in each patient according to their clinical experience.

For severity assessment, GPs were requested to classify patients into one of four different severity levels: intermittent, mild persistent, moderate persistent, and severe persistent, based on the GINA classification system [12], according to pre-existing clinical/functional data and level of treatment of the patients as a practical means to overcome the difficulties of GINA guideline application in populations already receiving treatment, and in accordance with previous research [13]. Regardless of the accuracy of these data, acquisition of severity as stated by the GPs is crucial since it should reasonably have guided treatment prescription.

The therapeutic groups considered for assessing adherence to the guidelines were those listed in GINA GL for the treatment of asthma. Adherence to GL was evaluated comparing GPs drug prescriptions with those expected in relation to GINA severity level as stated by each GP (Additional Table 1) [12].

Statistical analyses

Statistical analyses were carried out using the Statistical Package for the Social Sciences, release16.0. (SPSS Inc, Chicago, Illinois, USA). Frequency distribution, cross tabulations, and non-parametric Mann-Whitney tests were used in order to describe the pattern of the outcomes of interest. The χ^2 test with Yates's continuity correction or Fisher's exact test was used to compare asthma prescriptions in relation to asthma severity levels, in asthmatics with or without concomitant AR. A multiple logistic regression analysis was applied with asthma control (0. poor/partial control, 1. good/optimal control) as the dependent variable and age groups (0. 14 - 30 years, 1. 31 - 46 years, 2. 47 - 89 years), sex (0. males, 1. females), any asthma comorbidity (AR, chronic sinusitis, nasal polyposis, chronic bronchitis, emphysema) (0. no, 1. yes),

severity levels (0. intermittent, 1. mild persistent, 2. moderate persistent, 3. severe persistent), drug use (0. no anti-asthmatic drugs, 1. combination of anti-asthmatic and other drugs, 2. only anti-asthmatic drugs) and prescriptive adherence to GINA GL (0. no, 1. yes) as potentially explanatory (independent) variables.

A *p* value of <0.05 was considered statistically significant.

Results

Table 1 reports general characteristics, asthma severity levels, drug use, comorbidity and asthma control of the studied patients. Overall 995 asthmatics (55.2% females) were enrolled by GPs, mean age was 43.3±17.7 years. In 7% of cases, GPs had not assessed asthma severity, and for 2.7% no information on severity was provided. GPs classified most patients (73.7%) as intermittent or mild persistent asthmatics. The category of severe persistent asthma was attributed only in 3.6% of cases. The majority (65.6%) of patients were taking only anti-asthmatic drugs while 27% a combination of anti-asthmatic and other drugs. 36.4% of patients reported any asthma comorbidity: AR (60.6%), chronic sinusitis (14.5%), nasal polyposis (11.6%), chronic bronchitis (22.3%), emphysema (8.2%). Only 67.4% of all patients had a good/optimal asthma control.

Asthma treatment

The prevalence rates (%) of GPs prescriptions, as recommended and not recommended by GINA GL, in patients stratified by severity level according to the GPs assessment, were shown in Table 2.

Prevalence rates of therapies recommended for steps 1 and 2 (inhaled corticosteroids (ICS) and leukotriene receptor antagonists (LTRA) monotherapies) were significantly or borderline (LTRA) higher in the intermittent group rather than in the persistent groups: short-acting β_2-agonists (SABA) 15.4%, absence of treatment 16.1%, ICS 14.0%, LTRA 2.5%. Step 3 therapy was significantly more frequent in mild persistent patients, considering combination treatment of ICS plus long-acting β_2-agonists (LABA) (40.1%) and borderline, considering ICS plus LTRA combination (3.5%). Step

4 therapy, in terms of ICS+LABA+teophyllines and ICS+LABA+systemic corticosteroids (SCS) combinations, was significantly more frequent in severe persistent patients: 6.3% and 15.6%, respectively; in terms of ICS+LABA+LTRA combination, it was significantly more used in moderate persistent patients: 16.7%.

Overall, combination treatment of ICS plus LABA was the most frequent prescription for asthma: 54.7% of patients were given such a combined prescription, singly or with other drugs, mainly in moderate (78%) and severe persistent (78.1%) patients, regardless of GINA recommendation.

ICS as mono-therapy or in combination with other drugs but LABA was the second most frequently adopted treatment (15.2%), mainly in the intermittent patients (16.8%), regardless of GINA recommendation. SABA were singly prescribed for 8.8% of the entire sample. LTRA and chromones as monotherapy were seldom prescribed: 1.4% and 0.3%, respectively. Moreover, 17.9% of asthmatic patients were prescribed therapeutic combinations not recommended by GINA GL, mainly if severe persistent patients (37.5%). Among these patients taking not recommended drugs, LABA and SCS were singularly prescribed in 2.4% and 3.4%, respectively.

In general, two or more drugs were simultaneously prescribed in 61.8% of the patients and the treatment was a single drug, mainly ICS, in 27.3%.

The prevalence rates (%) of prescriptions grouped in GINA not recommended and GINA recommended treatment steps, in relation to severity level stated by GPs, among patients with only asthma and with asthma and AR are shown in Figure 1. Step 1 treatment for asthma (SABA or no treatment), mainly frequent in intermittent asthma, was prescribed also in patients with persistent asthma both with (11.1%) or without AR (5.9%) (Additional Table 2). Conversely, steps 2-4 therapeutic options for mild,

moderate and severe persistent asthma were frequently prescribed in intermittent patients, mostly ICS+LABA or ICS+LTRA recommended for moderate persistent asthma treatment: 37.9% in patients with only asthma and 27.3% in patients with asthma+AR.

Mild persistent patients were also overtreated: 56% (asthma alone) and 59.1% (asthma+AR) with therapeutic options indicated for moderate and severe persistent asthma. The percentage of non recommended treatment options augmented with the increase of asthma severity reaching the highest prevalence rate in severe persistent patients (asthma alone 36.8% and asthma+AR 38.4%) (Figure 1).

Prescriptive adherence to GINA GL

In general, adherence to GL for asthma treatment was less than 30%. GPs were evenly compliant to GL while treating only asthmatics (28.7% of correct therapies) or patients with asthma and comorbid AR (28.9%) (Additional Table 3). The lowest adherence was found in patients with AR comorbidity in relation to prescriptions for mild persistent asthma (8.7%), whilst the highest in moderate persistent patients with only asthma (48.5%) (Figure 1).

Prescriptive adherence to GINA GL and asthma control

The results of a multivariate logistic regression model for assessing the relationship between a good/optimal asthma control and prescriptive adherence to GINA GL were reported in Table 3. The analysis takes into account also the role of other potential risk or protective factors: age groups, gender,asthma comorbidity (AR,

chronic sinusitis, nasal polyposis, chronic bronchitis, emphysema), asthma severity levels and drug use.

Prescriptive adherence to GINA GL significantly increased by 85% the probability to have a well controlled asthma than prescriptive non adherence. Moreover, any asthma comorbidity, moderate and severe persistent severity levels significantly decreased by 48, 56 and 94%, respectively, the probability to have a well controlled asthma with respect to absence of comorbidity or intermittent severity level.

Discussion

Main findings

This study found that the treatment for asthma most commonly prescribed by a sample of Italian general practitioners is a combination of ICS+LABA, either associated or not with other drugs. According to GINA GL asthma classification, our results indicate overtreatment of intermittent and mild persistent asthma, as well as a general poor adherence to GINA treatment recommendations, despite its confirmed role in achieving a good asthma control.

Strengths and limitations of this study

The main strength of this observational study is that data collection was conducted in real life, by acquiring relevant information on clinical management of asthma directly provided by GPs. Indeed, the highest quality evidence from randomized controlled trials is often based on highly selected patients but not representing the population of patients in day to day practice.

A higher number of enrolled asthmatic patients was expected based on asthma prevalence rates observed in Italian general population studies [2, 4]. However, it is to highlight that enrolled patients (n=995) were higher than the minimum number of subjects to select (n=776 asthmatic subjects), thus letting us perform analyses with a sufficient statistical power.

It is to remind that to keep control over prescribing behaviour in general practices is difficult. Since the prescribed treatment is a result of an agreement between the doctor and the patient, some deviations from the gold standard are to be expected. A limitation of our study is the use of the old classification of asthma severity. Indeed when the study was planned, the current GINA guidelines included the distinction in severity classes based on the frequency of symptoms and exacerbations, rescue medication use, limitation in daily life, and the level of pulmonary function impairment [12]. While this classification is easy to use in patients naive to treatment, severity assessment in patients under regular treatment is more difficult to be done. For this reason, this definition of severity was removed from the GINA guidelines, and changed in the assessment of the minimal level of pharmacologic treatment able to maintain the patient under control. In our study, we considered the definition of asthma severity performed by GPs as a “global assessment” of the burden of the disease in each single patient, independently from the recommended level of pharmacologic treatment. Thus, the impact of prescriptive adherence on asthma control was considered, taking into account the appropriate therapeutic steps related to asthma severity levels as stated by GPs.

Interpretation of findings in relation to previously published work

In general, a combination of two or more drugs was prescribed to about 61% of the patients (Table 2). This group comprises 65.1% of those with a GPs diagnosis of intermittent or mild persistent asthma: 51.4% and 75.8% of them were treated with polytherapy, respectively. About 69% had a prescription for ICS, singly or in combination. ICS are currently the most effective anti-inflammatory medications for treatment of all persistent asthma categories. They improve asthma control, lung function and prevent exacerbations [14]. The addition of LABA to ICS increases treatment efficacy in moderate-to-severe asthma. LABA must only be used in combination with an appropriate dose of ICS. In fact, when incorrectly prescribed or used as single therapy, they may be associated with serious asthma-related events, including death [12, 14], probably attributable to a lack of appropriate anti-inflammatory therapy in patients with frequent symptoms.

In the current study, LABA were incorrectly prescribed in a few cases (3.4%). Combined therapy of ICS and LABA is recommended as the preferred treatment for asthma control. Indeed, in our study, 54.7% of asthmatic patients were prescribed ICS+LABA, either associated or not with other drugs. However, ICS+LABA treatment is recommended by GINA GL for patients whose asthma is not adequately controlled by other maintenance therapies and for those with persistent moderate to severe asthma. In the present study, we found that 39.7% of the patients with intermittent asthma and 59.9% of the patients with mild persistent asthma were prescribed ICS+LABA, independently from their symptoms in the past year, thus indicating a possible overtreatment for these patients.

A study performed in the US on more than 16,000 asthmatics aged 12-65 years found that about 40% of patients met the criteria for appropriate prescription of ICS+LABA, and the patients with appropriate prescriptions were significantly more likely treated by pulmonologists and allergists than by GPs [15]. Furthermore, in Northern Ireland a wide use of ICS+LABA has been reported in 67% asthmatic patients without prior ICS therapy [16].

A considerable overtreatment with ICS in primary care patients has been observed in the Netherlands, where about 43% of asthmatic patients were prescribed ICS without a clear reason [17]. Conversely, our GPs did not use ICS to treat a not negligible proportion (9%) of patients with persistent asthma. Recent studies have shown that only a small percentage of asthmatic patients receives appropriate treatment with ICS [18]. SABA were singly used to treat 2.6% persistent asthmatic patients by our GPs. In the past, there has been concern that excessive uncontrolled use of beta-2 agonists might have contributed to rise asthma mortality and hospitalization risk [19, 20].

In disagreement with GINA GL, another erroneous treatment was the use of systemic corticosteroids in 3.4% of patients. These patients, mainly with comorbid AR and intermittent asthma, were treated with systemic corticosteroids alone or associated with SABA suggesting inappropriate management of asthma.

In general, a low adherence to GINA GL was found, although it augmented with increasing asthma severity and it has a positive impact on disease control regardless of asthma comorbidity and severity level. GPs and specialists co-management might probably explain the greater concordance with guideline recommendations among patients with more severe disease. The highest adherence to treatment was reached in

moderate and severe persistent asthma, considering both patients with only asthma (48.5%) and with concomitant AR (46.2%). Although standardized protocols, specifically designed to be practical and user-friendly, improve patient outcomes, some studies continue to show poor physician compliance with asthma management guidelines in clinical practice [21-23], regardless of patients characteristics [24]. In Denmark, among elderly patients who were taking multiple medicines, the therapeutic groups most commonly involved in inappropriate prescription included anti-asthmatics [25]. A recent Dutch study evaluated self-reported barriers that limit adherence of GPs to clinical practice guidelines; patient related barriers are those mostly reported, suggesting that current guidelines do not always adequately incorporate patient preferences, needs and abilities [26]. The belief that a recommendation could not be successfully implemented by patients likely makes the physician less adherent. Also in presence of self-reported appropriate knowledge of GL, GPs feel that they are limited by the difficulty to reconcile patient preferences with guideline recommendations. At last, GPs burnout and difficulty in incorporating innovative asthma decision tools into current workflow are recently identified as obstacles to guideline implementation and asthma outcomes improvement [27].

An interesting observation of our study was that adherence to GINA guidelines in terms of drug prescription was associated with a better asthma control, as assessed by GPs. This means that using the correct pharmacologic treatment as recommended by GL in relationship to the asthma severity level is associated with a better asthma outcome, and, thus, it should be extensively promoted.

Implications for future research, policy and practice

Since GPs often tend to treat patients independently from GL, a need for increased physician awareness of GINA guidelines is warranted. Although from the patient's perspective a good asthma care is costly, the cost of not treating asthma correctly is even higher.

Finally, there is a need to further explore why a gap still exists in the provision of evidence-based care for asthma in primary care, and to identify how GPs can be supported to encourage adoption of evidence-based practices. Programs that simplify use of guidelines, based on handier decision support tools and electronic technologies and an expanded medical team involving patient advocates, practice facilitators, school nurses, and pharmacists could improve the quality of asthma care within the primary care setting.

Conclusions

In Italy GPs treat a large number of asthmatic patients in discordance with GL recommendations. However, the adherence to GL enhances with increasing asthma severity and its positive impact on disease control is confirmed. Clinical practice guidelines need to be further disseminated and implemented through a wide range of efforts in order to achieve more effective asthma care.

Declaration of interest

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Authors' contributions

SB, MS, SM, PP, GV contributed to the study concept, design and interpretation; AA, FM, GS, SC, PS, APP, MB contributed to the data collection, analysis and interpretation.

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Table 1. Characteristics of asthmatic patients (n=995).	
	Asthmatic patients
Gender, N (%):	
males	446 (44.8)
females	549 (55.2)
Age (years):	
mean ± SD	43.3 ± 17.7
median, range	42, 14-89
GINA classification, N (%):	
intermittent	436 (48.4)
mild persistent	227 (25.3)
moderate persistent	204 (22.7)
severe persistent	32 (3.6)
Drug use:	
no anti-asthmatic drugs	55 (7.4)
anti-asthmatic + other drugs	202 (27.0)
only anti-asthmatic drugs	491 (65.6)
Comorbidity, N (%):	
allergic rhinitis	603 (60.6)
chronic sinusitis	102 (14.5)
nasal polyposis	79 (11.6)
chronic bronchitis	159 (22.3)
emphysema	55 (8.2)
*any asthma comorbidity**	269 (36.4)
Asthma control, N (%):	
poor	33 (4.0)
partial	238 (28.7)
good	433 (52.2)
optimal	126 (15.2)

* having at least one asthma comorbidity

Table 2. Prevalence rates (%) of GPs prescriptions, recommended and not recommended by GINA GL for the treatment of asthma, in patients stratified by severity level.

Treatments	Total N=899	Intermittent N=436	Mild persistent N=227	Moderate persistent N=204	Severe persistent N=32	p
GINA recommended						
STEP 1 therapy:						
SABA	8.8	15.4	4.0	1.5	---	<0.001
Without treatment	10.9	16.1	9.3	2.9	3.1	<0.001
STEP 2 therapy:						
ICS	10.9	14.0	10.1	5.9	6.3	0.02
Chromones	0.3	0.7	---	---	---	n.s.
LTRA	1.4	2.5	0.9	---	---	b.l.
STEP 3 therapy:						
ICS+LABA	34.0	29.8	40.1	39.2	15.6	0.002
ICS+ Teophyllines	---	---	---	---	---	---
ICS+LTRA	1.8	0.7	3.5	2.5	---	b.l.
STEP 4 therapy:						
ICS+LABA+Teophyllines	0.4	---	0.4	0.5	6.3	<0.001
ICS+LABA+LTRA	8.1	3.9	7.5	16.7	15.6	<0.001
ICS+LABA+SCS	5.3	3.7	6.2	6.4	15.6	0.02
GINA not recommended						
LABA monotherapy	2.4	2.3	4.4	1.0	---	n.s.
SCS monotherapy	3.4	5.3	2.2	1.5	---	0.03
LABA+other[°]	1.0	---	1.3	1.5	9.4	<0.001
ICS+other[§]	2.3	2.1	1.8	3.4	3.1	n.s.
ICS+LABA+other[$]	6.9	2.3	5.7	15.2	25.0	<0.001
Other combinations*	1.8	1.4	2.6	2.0	---	n.s.

[°] other: LTRA/SCS/anti-cholinergics/teophyllines/LTRA+SCS/LTRA+ anti-cholinergics/LTRA+teophyllines+SCS

[§] other: chromones/SCS/ LTRA+SCS

[$] other: LTRA+SCS/chromones/LTRA+ anti-cholinergics/anti-cholinergics/ anti-cholinergics+SCS/ LTRA+teophyllines+anti-cholinergics/teophyllines+SCS/chromones+SCS /teophyllines+anti-cholinergics+SCS /LTRA +anti-cholinergics+SCS /LTRA+teophyllines/LTRA+teophyllines+SCS

*Other combinations not recommended in GINA guidelines (13): anti-cholinergics /teophyllines /anti-cholinergics+SCS/teophyllines+anti-cholinergics/LTRA+SCS/LTRA+chromones/LTRA +anti-cholinergics+SCS.

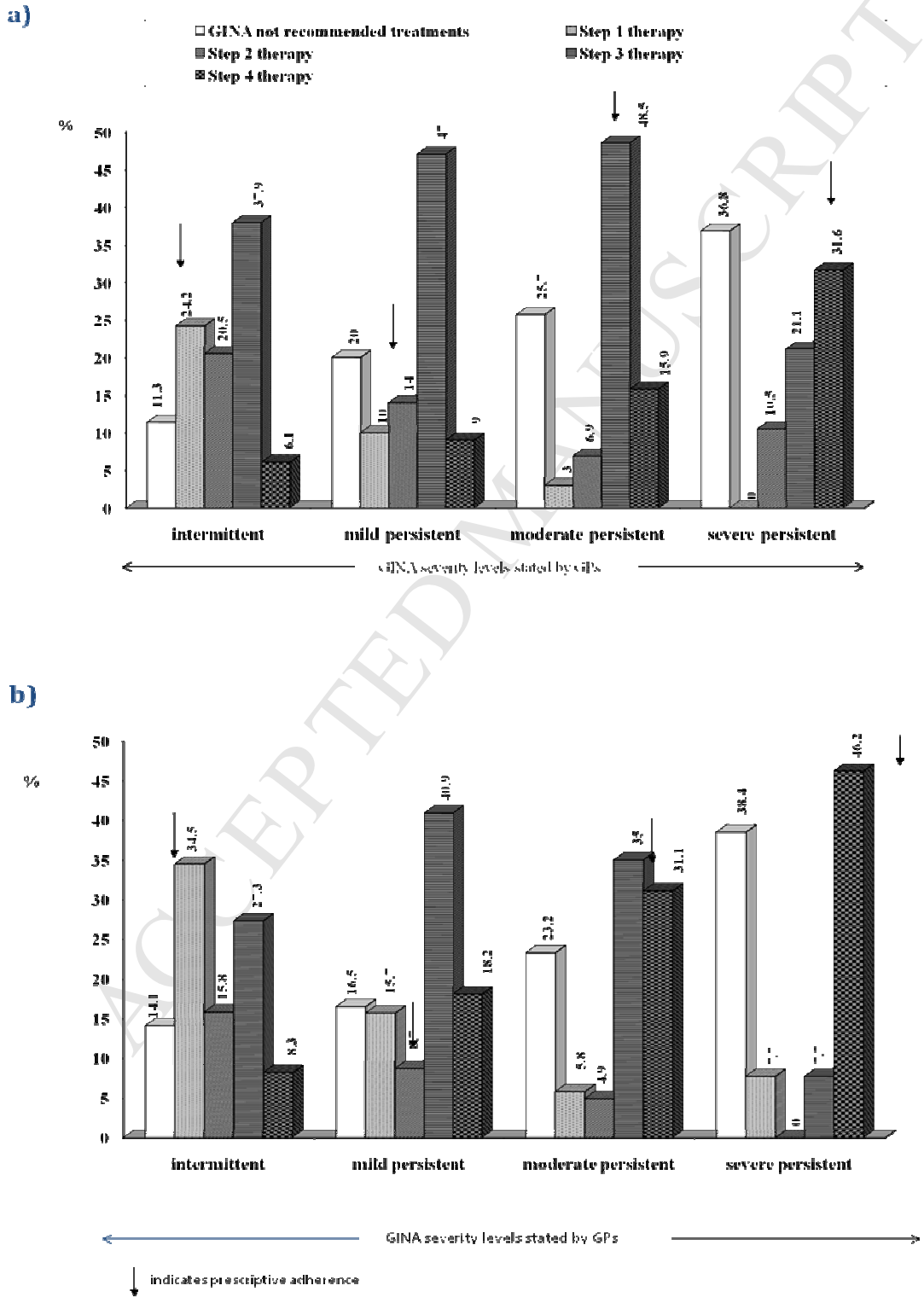
p: statistical significance by chi square test; n.s. not significant; b.l. borderline $0.05 < p < 0.10$

Table 3. Risk and protective factors for asthma control*: odds ratio (OR) and 95% confidence intervals (95% CI).

	OR	95% CI	p
Any asthma comorbidity:			
yes	**0.52**	**0.32-0.84**	**0.008**
Severity level:			
mild persistent	0.95	0.61-1.48	n.s.
moderate persistent	**0.44**	**0.28-0.69**	**<0.001**
severe persistent	**0.06**	**0.02-0.20**	**<0.001**
Prescriptive adherence:			
yes	**1.85**	**1.18-2.92**	**0.008**
Sex:			
females	0.81	0.56-1.16	n.s.
Age groups:			
31-46 yrs	1.12	0.70-1.81	n.s.
47-89 yrs	0.87	0.55-1.40	n.s.
Drug use:			
Anti-asthmatic + other drugs	1.30	0.55-3.10	n.s.
Only anti-asthmatic drugs	1.00	0.45-2.22	n.s.

*asthma control (poor/partial control=0, good/optimal control=1) as the dependent variable; any asthma comorbidity (0. no, 1. yes), severity levels (0. intermittent, 1. mild persistent, 2. moderate persistent, 3. severe persistent), prescriptive adherence to GINA GL (0. no, 1. yes), sex (0. males, 1. females), age groups (0. 14 - 30 years, 1. 31 - 46 years, 2. 47 - 89 years) and drug use (0. no anti-asthmatic drugs, 1. combination of anti-asthmatic and other drugs, 2. only anti-asthmatic drugs) as independent variables. Bold text indicates statistically significant associations.

Figure 1. Prevalence rates (%) of GINA not recommended prescriptions and recommended treatment steps, in relation to severity levels stated by GPs, in patients with only asthma (a) and in patients with asthma and allergic rhinitis (b).



""Prescriptive adherence to GINA guidelines and asthma control: an Italian cross sectional study in general practice"" by Sandra Baldacci, MSc; Marzia Simoni, MSc; Sara Maio, MSc; Anna Angino, Mrs; Franca Martini, Mrs; Giuseppe Sarno, MSc; Sonia Cerrai, MSc; Patrizia Silvi, Mrs; Anna Paola Pala, MSc; Megon Bresciani, MD; Pierluigi Paggiaro, MD; Giovanni Viegi,d, MD; ARGA Collaborative Group

Highlights

- Treatment for asthma most commonly prescribed by a sample of Italian general practitioners is a combination of ICS+LABA, either associated or not with other drugs.
- According to GINA GL asthma classification, our results indicate overtreatment of intermittent and mild persistent asthma.
- In Italy GPs treat a large number of asthmatic patients in discordance with GL recommendations.
- Adherence to GL enhances with increasing asthma severity.
- Adherence to GL has a positive impact on disease control.

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Data statement

All necessary data to support the conclusions of this study are available within the manuscript and its supplementary information files.

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