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General practitioners' prescribing behaviour as a determinant of poor persistence with inhaled corticosteroids in children with respiratory symptoms: mixed methods study

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ABSTRACT

Objectives: To evaluate general practitioners' (GPs') prescribing behaviour as a determinant of persistence with and adherence to inhaled corticosteroids (ICS) in children.

Design: Prospective observational study of persistence with and adherence to ICS followed by a focus group study of the GPs prescribing this treatment.

Setting: 7 primary care practices in the area of Zwolle, the Netherlands.

Participants: 134 children aged 2–12 years had been prescribed ICS in the year before the study started by their 19 GPs.

Main outcome measures: Patterns and motives of GPs' prescribing behaviour and the relationship with persistence with and adherence to ICS.

Results: GPs' prescribing behaviour was characterised by prescribing short courses of ICS to children with various respiratory symptoms without follow-up for making a diagnosis of asthma. This was driven by the GPs' pragmatic approach to deal with the large number of children with respiratory symptoms, and by beliefs about ICS which differed from currently available evidence. This prescribing behaviour was the main reason why 68 (51%) children did not persist with the use of ICS. In children with persistent use of ICS and a GP's advice to use ICS on a daily basis, the median (IQR) adherence was 70% (41–84%), and was similar for patients with persistent asthma and children lacking a diagnosis or symptoms of asthma.

Conclusions: Inappropriate prescription of ICS to children by GPs is common and drives the lack of persistence with ICS therapy in primary care. This finding should be taken into account when interpreting data from large prescription database studies. Improving primary healthcare providers' knowledge and competence in diagnosing and managing asthma in children is needed.

ARTICLE SUMMARY

Article focus

- Persistence with inhaled corticosteroids (ICS) in children is poor, and patients and parents are usually held responsible.
- Physician's prescribing behaviour has received little attention in the literature to date as a determinant of poor persistence with ICS.
- We evaluated general practitioners' (GPs') prescribing behaviour as a determinant of persistence with and adherence to ICS in children.

Key messages

- GPs' prescribing behaviour was characterised by prescribing short courses of ICS to children with various respiratory symptoms without follow-up and without diagnosing asthma.
- This was driven by the GPs' pragmatic approach to deal with the large number of children with respiratory symptoms, and by beliefs about ICS which differed from currently available evidence.
- The very low persistence with ICS in children is largely explained by this prescribing behaviour.

Strengths and limitations of this study

- By collecting detailed information about the patients' symptoms and ICS use, and on the reasons and motivations for GPs' prescribing behaviour, a novel explanation for the previously described poor ICS persistence in children was provided.
- The generalisability of this study may be limited because we studied only the GPs willing to participate in the study, but we found several similarities of our findings with previous reports of prescribing patterns of ICS in primary care in several countries.

INTRODUCTION

Childhood asthma guidelines are unanimous in recommending daily inhaled corticosteroids (ICS) maintenance treatment only for children with persistent asthma.[1–3] Maximal efficacy of such treatment can only be achieved by high adherence rates above 80% of prescribed dosages and by persistence with this therapy over long periods.[4] To

ensure this, close follow-up of children with asthma is recommended.[1–3]

In daily practice, however, both persistence with ICS prescriptions and adherence to their daily use is usually poor. Only half of the children having received a first prescription of ICS have an ongoing prescription 1 year later (poor persistence), and adherence rates to daily ICS use range from 30% to 70% in different studies.[5–7] Patients and their parents are usually held responsible for the poor persistence and adherence to ICS treatment,[8 9] and interventions to enhance medication adherence are focused on how healthcare providers can improve patients' and their parents' adherence behaviour.[10]

In disagreement with childhood asthma management guidelines, most children with asthma are not being followed up regularly in primary care,[11 12] and many children with an ICS prescription have not been diagnosed with persistent asthma.[7 13] Although these observations suggest that physician's prescribing behaviour and primary healthcare organisation issues also may be important in determining poor persistence with and adherence to ICS treatment in children with asthma, this has received little attention in the literature to date. In particular, the reasons why primary care physicians choose to deviate from their childhood asthma management guideline have not been explored to our knowledge. We designed this study to evaluate primary healthcare providers' prescribing behaviour, both quantitatively and qualitatively, and the role of this behaviour in persistence with and adherence to ICS prescriptions in children with asthma in primary care.

METHODS

This was a sequential mixed-methods study, starting with a quantitative study on ICS prescriptions and adherence to ICS use in children 2–12 years of age in primary care, followed by a qualitative study in which general practitioners (GPs) were interviewed about the motivation underlying their prescription patterns.

Participating GPs

Nineteen GPs in the catchment area of our hospital, both from rural and urban regions' primary care practices, were willing to participate in the study. GPs who had participated in a previous study from our clinic were approached, after which these GPs recruited colleagues. The mean age of the participating GPs was 50 years (range 35–65 years), and they had been in practice for a mean of 15 years. There were 16 men (84%); most GPs (16, 84%) worked in group practices. The six GPs initially approached because of their previous participation in a study were known for their interest in childhood asthma care, the other GPs did not follow specific courses on the management of childhood asthma.

Inclusion of children

The quantitative part of our study was a 12-month longitudinal study in which adherence was measured electronically in children with persistent ICS use. GPs provided details of all 2-year-old to 12-year-old children who had received an ICS prescription in the last 12 months. These children were eligible for inclusion in our study. We excluded children who had been referred to secondary care for respiratory symptoms, those with severe comorbidity, and children whose parents had insufficient knowledge of the Dutch language. We approached not more than 20 children per GP to prevent over-reliance of study results on GPs with high ICS prescription rates, and included only one child per family. Patients who had not used ICS and had had no asthma symptoms in the last 6 months, and patients with occasional intermittent ICS use (less than 2 weeks/year) were excluded from the 12-month longitudinal study.

Interviews with parents

To obtain a cross-sectional assessment of ICS prescription patterns in primary care, parents who agreed to participate were interviewed in a structured fashion about respiratory symptoms, ICS use and bronchodilator use of their child in the past 12 months.

Assessing adherence

In patients with persistent use of ICS by metered dose inhaler (MDI)/spacer combination or dry powder inhaler (DPI), adherence was monitored during the 12-month longitudinal follow-up study by the Smartinhaler (MDI) or the SmartDisk (DPI), electronic devices logging date and time of each ICS actuation.[14 15] Patients were excluded from adherence analysis if their ICS were withdrawn and stopped within 3 months of entry into the longitudinal follow-up study. In all other patients, adherence was calculated as the number of Smartinhaler-recorded or SmartDisk-recorded inhaled doses expressed as a percentage of the number of doses prescribed, and censored at 100% of the prescribed dose.[15] At the end of the 1-year follow-up study, respiratory symptoms were recorded by validated questionnaire,[16] supplemented with parental information about doctor's prescription of ICS and bronchodilators, and about the GP's advice on how to use these medications. Data on follow-up visits and organisation of asthma care were obtained by chart review.

Interviews with GPs

After completing the 1-year follow-up in all the patients, the aggregated adherence results and data on follow-up and organisation of asthma care were discussed in a 2.5 h focus group interview to which all participating GPs were invited, eight of whom (representing all primary practices involved in the study, mean age 54 years, range 39–65 years) participated. Patterns of prescription of asthma medication to children and deviations from the primary care childhood asthma practice guideline were discussed. Reasons and motives for this behaviour were explored in a non-judgmental manner, along with a discussion of perceived advantages and drawbacks of the GPs' prescribing behaviour. This

interview was audio recorded and analysed using standard methods of qualitative studies, as in earlier work from our group.[17] At the end of the focus group interview, a theoretical framework of the views discussed was developed by the senior researcher based on a recapitulation of the main findings, which was discussed and modified through discussion with all participating GP's until everyone present agreed with the final framework. The transcript was charted according to this theoretical framework, focused on detection of quotations not supporting the original framework or providing new categories or themes. The five themes that emerged from the date comprised: 'bridging a period of symptoms', 'difficulties in establishing a diagnosis of asthma', 'a pragmatical way of working', 'organisational issues' and 'perceptions about asthma and ICS'. The final interpretation of the data and the analysis of their possible explanations were checked by one of the attending GPs.

Ethical considerations

This study was approved by the hospital ethics review board; all the parents provided written informed consent.

RESULTS

Patients

Patient recruitment is presented in figure 1. The 19 GPs had a mean of 11 (range 3–28) patients between 2 and 12 years of age who had received a prescription of ICS in the last year, had no severe comorbidity and had never been referred to secondary care. Of the 165 eligible children, parents of 12 children could not be reached by telephone and 19 declined participation, leaving a total of 134 children whose parents provided information about ICS use. Only 66 of these children (49%) fulfilled the criteria of persistent ICS use. Their adherence to ICS maintenance therapy was measured electronically for 1 year. During this period, seven children were lost to follow-up (figure 1).

Result of interviews with parents of children being prescribed ICS

Of the 134 patients (median age 5.7, IQR 4–9.8 years) whose parents were interviewed, ICS were stopped completely or used for less than 2 weeks/year in 68 (51%). Parents of 43 (63%) of these patients with non-persistence with ICS reported that they had been using ICS in short courses at the GP's advice, and 14 of these parents (21%) reported that their child had been using only one single course of ICS ever (table 1). Parents of 21 children (31%) reported chronic cough as the main symptom of their child; 18 parents (26%) reported that their child had never been prescribed a bronchodilator. Three children had been using ICS for episodes of croup.

Symptoms and medication use during 1 year follow-up

Of the 59 children (median age 7.3, IQR 5–10.8 years) completing the 1-year adherence monitoring period, 26 (45%) never received a diagnosis of asthma according to the parents (table 2). Based on parental report and chart review, 15 (26%) and 11 patients (19%) had never wheezed or suffered from breathlessness, respectively, and parents of 10 patients (17%) reported that ICS had been prescribed for persistent cough. During the 1-year follow-up period, 13 children (22%) remained completely free from wheezing or breathlessness. Bronchodilators had never been prescribed to six patients (10%); eight others (14%) had been recommended to use their bronchodilator on a daily basis (table 2). Although older children more frequently had a diagnosis of asthma (56% vs 21%, p=0.008) and were more often advised to use ICS regularly (78% vs 43%, p=0.001), differences between age groups in reported symptoms supporting an asthma diagnosis or the frequency of such symptoms were small (all p values >0.1, table 2).

Determinants of adherence during 1 year follow-up

During the 1-year follow-up, electronic adherence measurements were collected for a median (IQR) of 238 (121–350) days. Missing days were caused by children stopping ICS at their GP's advice during a 'good' season with little symptoms, children in whom ICS therapy was stopped altogether because of clinical remission and by technical device failures. Parents of 13 patients reported that their GP had recommended using ICS episodically when the child was symptomatic, but parents of 4 of these children administered ICS to their child for more than 50% of days.

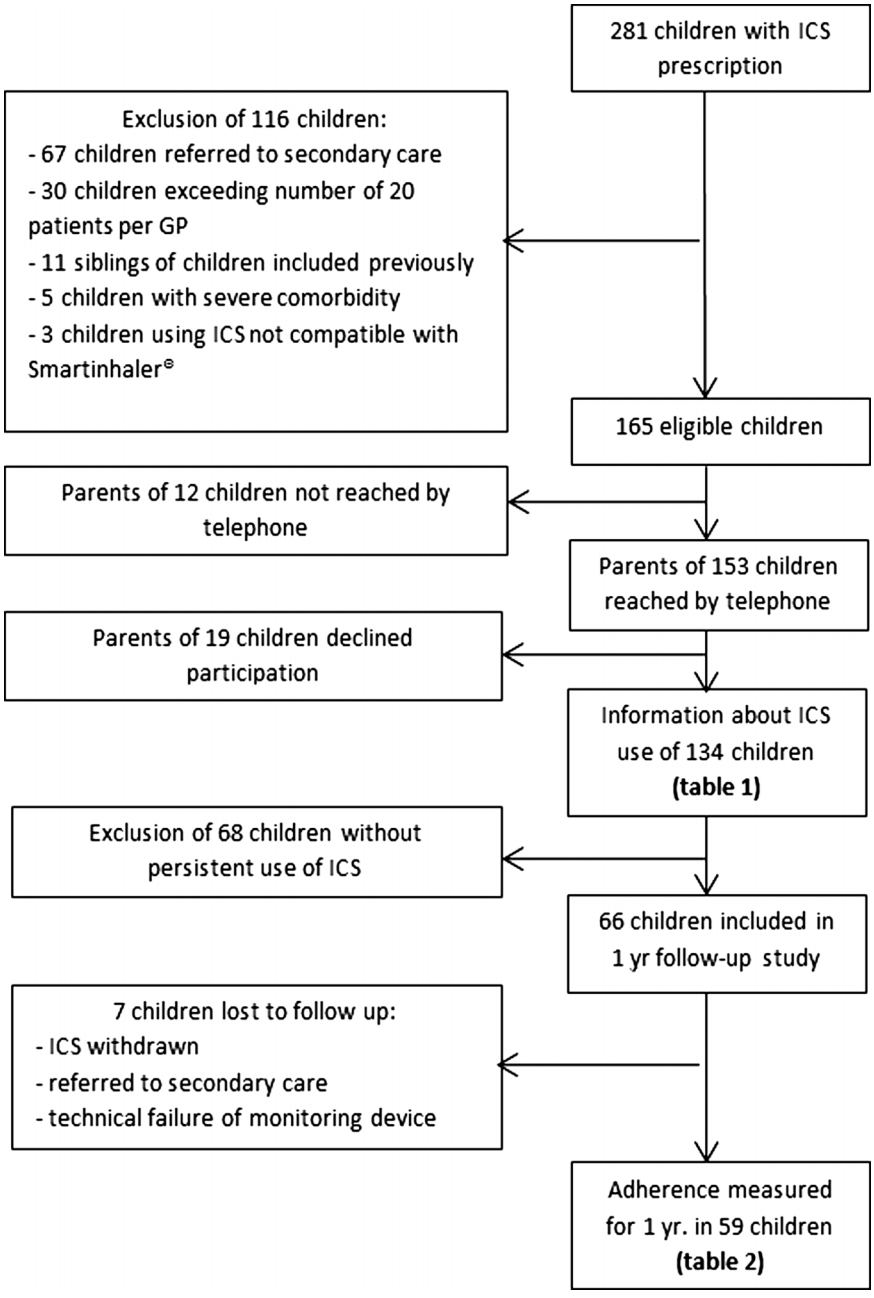
In the 46 children who were prescribed long-term daily ICS, the median (IQR) adherence rate was 70% (41–84%); 32 children (70%) had adherence rates below 80%. Adherence was not determined by the presence of symptoms supporting an asthma diagnosis or by frequency of symptoms (table 2).

Focus group interview with GPs

All GPs recognised the poor persistence with ICS and intermittent use of ICS as representative patterns of their prescription behaviour. As a general rule, they would prescribe a short ICS course to children with respiratory symptoms ranging from obvious wheezing and breathlessness to mild wheezing or persistent cough. Prescription of ICS in this way was accompanied by instruction to parents to return with their child after 6 weeks if symptoms persisted (which rarely occurred), or to stop ICS if symptoms resolved. GPs explained this prescription behaviour as a practical strategy to manage children with a range of respiratory symptoms without having to focus on making or excluding specific diagnoses.

> **GP 3:** It is not a conscious process; it is determined by the way we work.

Figure 1 Inclusion of patients.



For children with symptoms likely to be self-limiting, such as chronic cough, the main reason for ICS prescription was to 'bridge a period with symptoms'. In particular when parents were expecting or demanding a therapy, this strategy was used. In the GP's opinion, this satisfied parents and prevented lengthy discussions about the lack of effective treatment options for cough, and about the need for referral to secondary care.

GP 4: Parents and children are satisfied, that's great. The diagnosis doesn't really matter.

GP 1: I sometimes think back to the good old days when we were still allowed to use oral anticholinergics to help bridge a period of symptoms.

If symptoms returned in children with more obvious wheezing disorders, parents were encouraged to start another short ICS course themselves or the GP would prescribe it once again. Although GPs realised that they did not follow-up these patients or evaluated treatment effect, many considered these repeated ICS bursts as serial 'treatment trials', building up to an eventual asthma diagnosis in some children. Most GPs expressed lack of confidence in their ability to diagnose asthma, particularly in young children.

GP 8: It is symptom treatment, really. On and off, you know, without thinking about a diagnosis.

Table 1 Persistence of ICS use based on cross-sectional parental report (n=134)

	All children (n=134)	Children 2–4 years of age (n=47)
Non-persistent use		
Use of ICS only in periods with symptoms (as prescribed by GP, for various respiratory symptoms), >6 months no symptoms	43 (32%)	24 (51%)
Short course of ICS once in first wheezing episode	14 (11%)	6 (13%)
Daily use of ICS stopped at GP's advice because of remission of symptoms	11 (8%)	6 (13%)
Persistent use		
Persistent use in children	66 (49%)	11 (23%)

GP, general practitioner; ICS, inhaled corticosteroids.

GP 5: A diagnosis of asthma is rarely made by me; I guess this happens mainly in secondary care. They have better diagnostic tools there, like lung function.

Besides the two main reasons for prescribing short courses of ICS (bridging a period of symptoms and working on establishing a diagnosis of asthma), GPs expressed additional perceptions about ICS and asthma that supported their prescribing behaviour. Most GPs viewed a 6-week course of ICS as an effective treatment option for children with chronic cough or intermittent wheezing. For some GPs this view was driven by their perception that these symptoms could be presenting symptoms of asthma.

GP 6: Cough is also an expression of inflammation, which ICS may help to control.

This prescribing behaviour was also driven by the GPs' desire not to undertreat asthma. In their opinion the pros of this approach (not undertreating asthma) outweighed the cons (overtreatment of non-specific cough and mild intermittent wheezing with ICS), because they viewed short ICS courses as harmless. They remarked that the reactive organisation of primary healthcare for children (ie, seeing the child only when symptoms occurred) instead of being proactive (with scheduled follow-up) enhanced this prescribing behaviour.

GP 3: Most important lesson of this study for me? Making asthma care more proactive!

DISCUSSION

This study shows a common practice of prescribing short courses of ICS to children with various respiratory symptoms in primary care. This prescribing behaviour, which deviates from primary care childhood asthma management guidelines, is driven by a pragmatic approach aimed at symptom treatment rather than making or excluding the diagnosis of asthma, and is enhanced by

Table 2 Characteristics of 59 children in whom adherence was measured electronically for 1 year

		All children (n=59)	Children 2–4 years of age (n=14)	Median adherence for children advised to use ICS on a daily basis (IQR)
GP's advice	Use ICS daily	46 (78%)	6 (43%)	70% (41–84%)
	Use ICS in symptomatic episodes only	13 (22%)	8 (57%)	Not calculated
Symptoms not supporting asthma diagnosis	Never wheezing	15 (25%)	4 (28%)	70% (31–82%)
	Never breathlessness	11 (19%)	3 (21%)	66% (53–81%)
	ICS as treatment for persistent cough	10 (17%)	5 (36%)	71% (60–85%)
No GP diagnosis of asthma		26 (44%)	11 (79%)	67% (22–85%)
Frequency of wheezing/ breathlessness in patients always wheezing and/or breathless	This year no symptoms	13 (22%)	5 (36%)	61% (54–87%)
	This year 1–3 periods with symptoms	25 (42%)	5 (36%)	70% (30–81%)
	This year >3 periods with symptoms	21 (36%)	4 (28%)	73% (26–87%)
Use of bronchodilator	Used daily	8 (14%)	1 (7%)	76% (52–87%)
	Never prescribed, never used	6 (10%)	4 (28%)	77% (70–86%)

GP's advice, general practitioner's advice; ICS, inhaled corticosteroids.

the reactive organisation of primary care, where children are mainly being seen when symptoms occur, instead of being followed up regularly. Many GPs expressed perceptions about ICS and asthma which are in disagreement with the currently available evidence, stimulating the overtreatment of children with non-specific or mild intermittent respiratory symptoms. The very low persistence with ICS in children is largely explained by this prescribing behaviour. Of the 59 children with persistent use of ICS, 20% used ICS only during symptomatic episodes (at the GP's advice) and a similar proportion had no asthmatic symptoms ever but used ICS on a daily basis. Children with persistent wheeze were also commonly treated with intermittent courses of ICS.

The high ICS prescription rates in children without persistent asthma and low persistence with ICS that we found confirm results from previous studies in various countries. In two Dutch primary care studies, ICS were frequently prescribed to children and adults without a diagnosis of persistent asthma, and ICS persistence over a 1-year follow-up period was only 50%.[7 18] In a large Dutch birth cohort study, 36% of children 2–8 years of age used ICS without having reported a single episode of wheezing in the past 2 years.[19] Several UK studies also reported high ICS prescription rates in children without persistent asthma, but with intermittent wheeze or chronic cough, together with low persistence with ICS therapy.[5 13 20] A recent Swedish study reported the same pattern of poor persistence with ICS, although the authors did not consider liberal ICS prescription by physicians.[21] Although it has been speculated that low ICS persistence rates could be explained by the use of ICS as a diagnostic treatment trial in children with non-specific respiratory symptoms, previous studies never examined the reasons for ICS prescription behaviour of GPs.

Our focus group interview with GPs now provides unique and innovative insights into the pragmatic way in which GPs deal with the large number of children presenting with various respiratory symptoms. In agreement with our results, previous studies reported that primary care paediatricians from the USA and Spain recommended short-course ICS therapy for fictional patients with asthma, virus-induced wheeze and bronchiolitis.[22–24] In these studies, primary care physicians with limited experience in respiratory disorders were most likely to show this erratic prescribing behaviour. Our study indicates that such limited experience is associated with lack of confidence in making or excluding a diagnosis of asthma, particularly in young children, and with non-evidence-based perceptions about the effects of short-course ICS therapy on cough and on mild intermittent wheezing, confirming findings from a previous study.[25]

Because establishing the diagnosis of asthma may indeed be difficult, in particular in young children,[26] and because most respiratory symptoms in young children are transient, the pragmatic approach of GPs to treat non-specific respiratory symptoms with short courses of ICS is understandable, particularly when considering their view that short ICS courses are harmless and that they do not want to undertreat asthma. Nevertheless, there are numerous reasons to discourage this practice. First, even though most of these children inappropriately being prescribed ICS used the medication only briefly, some of these children were unnecessarily exposed to daily ICS for long periods of time, increasing the risk of exposure to high doses of ICS and their associated side effects.[27] Second, under this regime, children with asthma were also treated intermittently with ICS instead of the recommended daily use.[1–3] Third, inappropriate ICS treatment may distract from appropriately diagnosing and treating the real cause of their respiratory symptoms, such as a lower respiratory tract infection or allergic rhinitis.[28] Fourth, prescribing ICS to satisfy parents and to avoid lengthy discussions about referral or the lack of effective treatment for cough, although helpful in running an efficient clinic in the short term, may jeopardise a constructive physician–patient–parent relationship in future consultations. Finally, unnecessary ICS treatment for non-specific cough generates considerable societal costs (an estimated €1 million per annum in our country for 17 million inhabitants).

Our study has considerable implications both for research and for clinical practice. ICS persistence and adherence studies are usually based on large pharmacy databases, with limited information about physician's considerations, beliefs and prescribing practices. Such studies rely heavily on appropriate diagnosing and prescribing behaviour of physicians, while our study illustrates how important it is to take the physicians' prescribing behaviour into account to interpret and understand these data. The GPs in our study acknowledged the problem of lack of proactively organised primary care for children with respiratory symptoms, and suggested using specialised nurses as an important solution to ensure scheduled follow-up for these patients. Previous studies from our group have shown that children with a confirmed diagnosis of asthma can effectively and cost-efficiently be followed up by asthma nurses.[29] The GPs themselves, however, are responsible for solving the problem of inappropriately prescribing ICS to children without persistent asthma and advising short courses of ICS to children with asthma. The presence of erratic perceptions suggests the need for additional targeted training in asthma diagnosis and management for GPs. Such training has been shown to be effective in improving asthma care to children.[30]

Strengths and limitations

The main strength of this study is that we collected detailed information about the patients' symptoms and ICS use, and on the reasons and motivations for GPs' prescribing behaviour, which not only highlighted important areas for improvement in primary care for children with asthma, but also provided a novel explanation for the previously described poor ICS persistence in children. The main limitation is the generalisability of

this study because we studied only the GPs willing to participate in the study, a number of whom had shown specific interest in childhood asthma care. Because of this interest of these GPs, it is not likely other GPs perform better in prescribing ICS and following asthma guidelines. Although our study sample of GPs participating in the follow-up study and those participating in the focus group study may have been subject to selection bias, with relative over-representation of middle-aged male GPs, the striking similarities of our findings with previous reports of prescribing patterns of ICS in primary care in several countries[5 7 13 20–24] suggest that our findings can be applied to most settings of primary care.

A second limitation is recall bias because parental report of asthmatic symptoms in their children was recorded retrospectively, at the end of the follow-up period. However, because the questionnaire we used for this purpose was validated and has been used extensively in previous work, it is unlikely that this had a major influence on our findings.[16 19]

CONCLUSION

Inappropriate prescription of ICS to children by GPs is common and is driven by a pragmatic approach to treat symptoms rather than making or excluding a diagnosis of asthma, erratic perceptions about the efficacy of ICS in reducing persistent cough and mild intermittent wheeze, and a reactive organisation of primary care where scheduled follow-up is exceptional. The inappropriate prescribing behaviour of GPs that we observed drives the lack of persistence with ICS therapy in primary care and this finding should be taken into account when interpreting data from large prescription database studies. The large number of inappropriate ICS prescriptions together with intermittent therapy in children with asthma stresses the need to improve GPs' knowledge and competence in diagnosing and managing asthma in children in primary care.

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Competing interests None.

Patient consent Obtained.

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Notes