



Online Survey to Investigate Asthma Medication Prescription and Adherence from the Perspective of Patients and Healthcare Practitioners in England

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Background: High short-acting β_2 -agonist (SABA) use and/or inhaled corticosteroid (ICS) underuse are common and are associated with poor asthma outcomes. This study explored patients' and healthcare practitioners' (HCPs') perspectives to contextualize asthma treatment patterns observed in real-world studies.

Methods: Data were collected using online surveys from HCPs and people with asthma (≥ 18 years old with a confirmed asthma diagnosis of any severity) who had consented to research participation through the Clinical Practice Research Datalink. Data were analysed using descriptive statistics.

Results: In total, 76 HCPs and 63 patients were invited to take part. Of 48 valid HCP responders, 54.2% ($n=26$) reported scheduling an annual asthma treatment review with their patients and 83.3% of general practitioners ($n=40$) had prescribed repeated inhalers at the patient's request. Of 47 valid patient responders, 57.4% ($n=27$) reported using their reliever (SABA) inhaler daily and 55.3% of patients ($n=26$) reported being prescribed a preventer inhaler. Of the total patient responders, 31.9% ($n=15$) reported that they never used their preventer inhaler. Consistent annual adherence with preventer inhalers was reported by 44.7% of all valid responders ($n=21$), while other patients admitted to using preventers intermittently.

Conclusion: SABA and ICS prescription patterns are driven by a combination of HCP and patient factors. Opportunities exist to improve asthma control and behaviours around inhaler use.

Keywords: asthma, adherence, healthcare professional, ICS, prescription, SABA

Introduction

Asthma is a chronic inflammatory disease in which epithelial damage and bronchoconstriction result in increased mucus production, stimulating bouts of coughing, wheezing, and breathlessness.^{1,2} Treatment options involve the use of bronchodilators, usually short-acting beta-agonists (SABAs), colloquially termed "relievers", in combination with inhaled corticosteroids (ICSs), colloquially termed "controllers" or "preventers", to control and reduce the severity of symptoms, improve health outcomes, and reduce mortality. ICS therapy can also be used in combination with a long-acting bronchodilator as a reliever therapy.^{3,4}

The prolonged high use of SABAs is recognized as a marker for poor symptom control and is associated with exacerbations and hospitalization.⁵ Results from a large cohort study investigating asthma therapy prescriptions concluded that the use of SABAs (defined as ≥ 12 inhalers over 12 months) increased from 8.6% to 10.5% in UK adults during a 6-year period (2007–2013). Over the same period, SABA use in France was relatively stable, ranging from 5.4% to 5.2%.⁶ A recent study of 1288 asthma patients indicated that only 20% are "well-controlled" according to the Global Initiative for Asthma (GINA) classification.⁷

The majority of existing patient databases only include data on the amount of prescribed or dispensed medication, but are unclear about how much patients actually use, why and when, as well as the prescribing behaviours of general

practitioners (GPs). Therefore, understanding patients' behavioural patterns and HCPs' prescribing behaviours that result in low adherence to ICSs and relatively high SABA use will shape future practice. This requires recognition of the role played by prescribing practitioners in facilitating patient behaviours, ie their attitudes and approaches to prescribing. We aimed to explore the attitudes and behaviours of people with asthma and the prescribing behaviours of practitioners to help us to gain a better understanding of the reasons for and motivation behind SABA use, how this relates to ICS use, and ultimately, the impact on asthma-related healthcare resource utilization.

Methods

This was a cross-sectional online survey, exploring the perspectives of patients and healthcare practitioners (HCPs) to contextualize asthma treatment patterns.

Survey Development

Prior to distribution of the surveys, a small number of GPs, patients registered with a lay patient advisory group, and asthma patients from the NHS England clinical service critically appraised and validated the survey questions during several online discussions. The feedback helped us to modify and revise the questions for understandability,⁸ and to estimate the time it would take for participants to complete the surveys (see [Supplementary Materials](#)).

Study Population and Eligibility Criteria

The study population included HCPs from research-active GP practices contributing to the Clinical Practice Research Datalink (CPRD) Aurum and GOLD primary care databases who had agreed to take part in additional studies, and adult patients with a current asthma diagnosis who were registered in those practices. CPRD is a real-world research service supporting retrospective and prospective public health and clinical studies.^{9,10} CPRD holds an anonymized GP records database containing continually updated primary care medical data. This database includes details on symptoms, diagnoses, tests, prescriptions, patient demographics, health behaviours, and referrals to secondary care.

Survey Data Collection

Both the GP and the patient survey data were collected from 3 October 2022 to 30 November 2022. The GP survey was created in an online platform (Qualtrics) and administered by the CPRD team via a customized link. The CPRD team disseminated the online survey instructions together with the study information pack to GP practices indicating interest in participation in research ("research-active" practices). The CPRD team provided the relevant links to 130 GP practices for accessing and completing the online survey. Completed survey data were anonymized and accessed by the research team for analysis.

For the patient survey, CPRD screened patients for possible participation based on the following eligibility criteria: patients with a current diagnosis of asthma, aged 18 years and over, and without a COPD diagnosis. After screening, patients who met the inclusion criteria were sent an invitation to take part in the study by the relevant GP practice. Participants who expressed an interest to participate were then sent the study information pack, the online survey link, and instructions on how to complete the survey. After the survey had concluded, the research team were able to access data from the online platform for analysis.

Data Analysis

Descriptive analysis was used to report the proportions of responses from the HCPs and the patients. SPSS 26 statistical software was used.

Results

GP Survey

A total of 76 GPs participated in the online survey. After eliminating invalid responses (surveys that contained missing data and where key questions had not been answered), there were 48 valid responders. All of the following percentages

used 48 responders as the denominator. Overall, 47.1% (n=23) were female and 41.7% (n=20) male. Most respondents were in the age group 40–50 years (33.3%, n=16). Of the GPs, 27.1% (n=13) had been practising for 11–20 years and a similar number for 21–30 years. Half of the GPs reported seeing more than 10 patients with asthma in a month.

The survey results showed that 31.3% of GPs (n=15) prescribed SABAs differently in people also prescribed regular ICS compared with those on a single maintenance and reliever therapy (SMART) regime, while 29.2% (n=14) responded that they did not prescribe SABAs differently in people on regular ICS versus SMART; 39.6% (n=19) of answers to this question were missing. There were multiple reasons why GPs prescribed SABAs differently. Almost half of GPs (45.8%, n=22) said that they changed the prescription owing to poorly controlled symptomatic asthma; 54.2% (n=22) performed a treatment review for asthma patients as a scheduled annual review (Figure 1A and B), and 47.9% (n=23) reviewed the treatment in response to an increased quantity/frequency of SABA prescription and 45.8% owing to poorly controlled symptomatic asthma.

In total, 83.3% of GPs (n=40) claimed that they prescribed repeated inhaler prescriptions (reliever and preventer) because of patients' requests (Figure 1A and B). The reasons given for this varied from patients saying they needed extra inhalers (62.5%, n=30) to those having poorly controlled symptomatic asthma (60.4%, n=29). When asked to rank the reasons for prescribing specific inhalers, the majority of GPs said that the primary reason was patients' requests/repeat prescriptions, although this varied by inhaler type: 60.4% (n=29) SABA inhaler, 60.4% (n=29) ICS therapy, and 45.8% (n=22) SMART (Table 1).

Patient Survey

A total of 63 patients with asthma enrolled into the online survey. After eliminating invalid responses, there were 47 valid responders. All of the following percentages used 47 responders as the denominator. Of the 47 participants, 44.7% (n=21) said that they had been given an asthma treatment plan by their HCP, while 55.3% (n=26) said that they had not.

The survey found that 87.2% of participants (n=47) had been prescribed a reliever (blue/SABA) inhaler. Most patients (89.4%, n=42) said that they felt confident using their inhalers, whereas approximately 6% did not. Over half of the patients (57.4%, n=27) used their reliever inhaler frequently (25.5% of patients once a day, 21.3% twice a day, and 10.6% three or more times a day), whereas 42.6% of patients (n=20) never or rarely used it (Figure 1C). Furthermore, 59.6% of patients (n=28) were more likely to use the reliever during the cold/flu season, 42.6% during the allergy/pollen season, and 38.3% (n=18) before exercise or other known triggers. Only 19.1% (n=9) used the SABA inhaler the same amount throughout the year.

When responding to the question "What types of inhalers have you been prescribed?", of SABA, ICS, and SMART, 55.3% of respondents (n=26) reported that they had been prescribed a preventer (brown/steroid) inhaler (Table 2). But on the question "Are there times when you tend to use your preventer inhaler more often?", 17% of respondents (n=8) used it once a day and 31.9% twice a day, while only about 4% used it three or more times a day. Furthermore, 44.7% (n=21) adhered to their preventer inhaler the same amount throughout the year, while the rest of the participants used it depending upon certain circumstances, such as 17% (n=8) using it during the allergy/pollen season and 14.9% (n=7) during the cold/flu season (Figure 1D). As a result of the online survey being self-reported, there exist inconsistencies in the responses to these two questions; these may also have occurred because in the first question, the responses considered only SABA, but in the second question, they accounted for both SABA and SMART.

Overall, 40.4% of respondents (n=19) claimed that they had been prescribed a SMART regime (preventer + reliever). However, for the question "If you have been prescribed a combination (red and white) inhaler, are there times when you tend to use this in preference to the reliever (blue/SABA) inhaler?", of 47 responses, 70% (n=33) did not prefer to use SMART, and only 10.6% (n=5) preferred to use SMART during the allergy/pollen season rather than use SABA (Table 2).

Discussion

This study found numerous challenges to consistent adherence to controller medication for patients with asthma. It investigated SABA and ICS prescription patterns, showing how asthma control is driven by a combination of HCP and patient factors. At the individual level, patients' behaviours with regard to medication adherence play an important role in their illness control; we found that only slightly more than half of the patients adhered to their preventer medication and

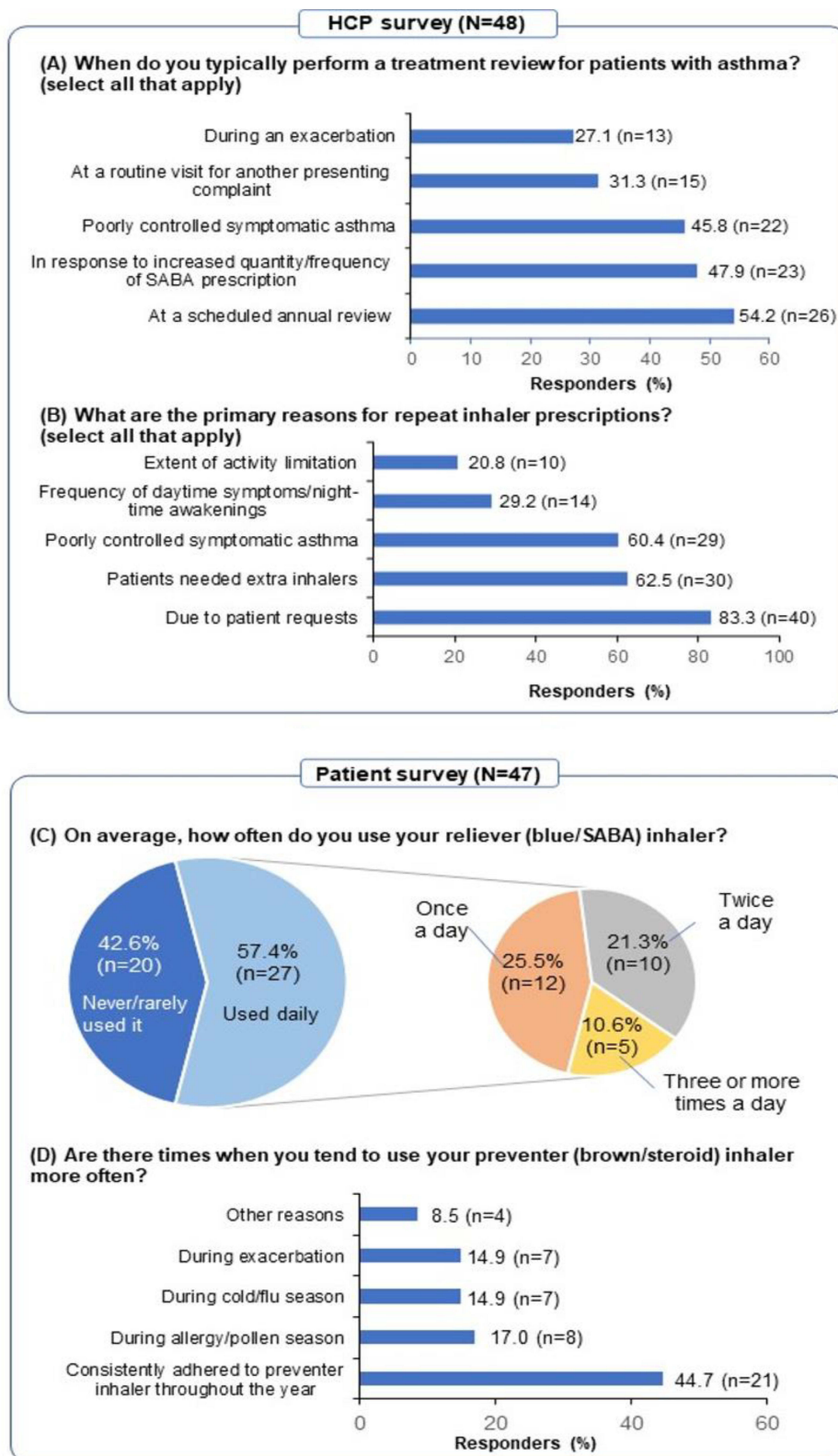


Figure 1 Responses received from healthcare practitioners (HCPs) and patients. **(A and B)** Responses received from HCPs. **(C and D)** Responses received from patients with asthma.

Table I Survey Responses from GPs

Survey Questions		Frequency (N=48)	Percentage (%)
How many asthma patients do you see in a month?	<5	8	16.7
	5–10	16	33.3
	>10	24	50.0
The primary reasons for repeat inhaler prescriptions (select all that apply)	Patient request/repeat prescription	40	83.3
	Need for extra inhalers	30	62.5
	Poorly controlled symptomatic asthma	29	60.4
	Frequency of daytime symptoms/night-time awakenings	14	29.2
	Extent of activity limitation	10	20.8
The primary reasons for prescribing a SABA inhaler (number and percentage ranking as number 1 most relevant out of 4)*	Patient request/repeat prescription	29	60.4
	Need for extra inhalers (most relevant responses)	3	6.3
	Mild intermittent asthma	9	18.8
	Poorly controlled symptomatic asthma	7	14.6
The primary reasons for prescribing ICS therapy (number and percentage ranking as number 1 most relevant out of 6)*	Patient request/repeat prescription	29	60.4
	Stepping up therapy	8	16.7
	Seasonal risk factors for exacerbation	1	2.1
	Benefit-risk over current therapies	4	8.3
	Frequency of daytime symptoms/night-time awakenings	4	8.3
	Extent of activity	2	4.2
The primary reasons for prescribing SMART therapy (number and percentage ranking as number 1 most relevant out of 6)*	Patient request/repeat prescription	22	45.8
	Stepping up therapy	15	31.3
	Seasonal risk factors for exacerbation	1	2.1
	Benefit-risk over current therapies	8	16.7
	Frequency of daytime symptoms/night-time awakenings	0	0.0
	Patient preference	2	4.2
Do you prescribe SABA differently in people on regular ICS versus SMART regime?	Yes	15	31.3
	No	14	29.2
	Missing answers	19	39.6

(Continued)

Table 1 (Continued).

Survey Questions		Frequency (N=48)	Percentage (%)
Why do you prescribe SABA differently in people on regular ICS versus SMART regime? (select all that apply)	Poorly controlled symptomatic asthma	22	45.8
	Seasonal risk factors for exacerbation	15	31.3
	Patient request/repeat prescription	18	37.5
	Need for extra inhalers	7	14.6
	Patient intolerance of SMART regime	12	25.0
When do you typically perform a treatment review for asthma patients? (select all that apply)	At a scheduled annual review	26	54.2
	At a routine visit for another presenting complaint	15	31.3
	In response to increased quantity/frequency of SABA prescription	23	47.9
	Poorly controlled symptomatic asthma	22	45.8
	During an exacerbation	13	27.1

Note: *For these survey questions, only the responses with rank 1 (most relevant responses) have been presented in the table.

Abbreviations: SABA, short-acting β_2 -agonist; ICS, inhaled corticosteroid; SMART, single maintenance and reliever therapy.

Table 2 Survey Responses from Patients

Survey Questions		Frequency (N=47)	Percentage (%)
What types of inhalers have you been prescribed? (select all that apply)	Reliever (blue/SABA)	41	87.2
	Preventer (brown/steroid)	26	55.3
	Combination, eg SMART regime (preventer + reliever)	19	40.4
Have you been shown how to use your inhalers by your healthcare professional?	Yes, and I feel confident using it	42	89.4
	Yes, but I do not feel confident using it	3	6.4
	No, but I feel confident using it	5	10.6
	No, and I do not feel confident using it	0	0.0
	I have not been given instructions on how to use my inhalers	2	4.3
On average, how often do you use your reliever (blue/SABA) inhaler?	Once a day	12	25.5
	Twice a day	10	21.3
	Three or more times a day	5	10.6
	Never or rarely use it	20	42.6

(Continued)

Table 2 (Continued).

Survey Questions		Frequency (N=47)	Percentage (%)
Are there times when you tend to use your reliever (blue/SABA) inhaler more often? (select all that apply)	Yes – during allergy/pollen season	24	51.1
	Yes – during cold/flu season	28	59.6
	Yes – before exercise or other known triggers for my asthma	18	38.3
	Yes – for other reasons	12	25.5
	No – there is no difference; I use my inhaler the same amount throughout the year	9	19.1
On average, how often do you use your preventer (brown/steroid) inhaler?	I do not use it	15	31.9
	Once a day	8	17.0
	Twice a day	15	31.9
	Three or more times a day	2	4.3
	Several times per week (increase in symptom severity)	1	2.1
	Seasonal use only	3	6.4
	Increased use during allergy/pollen and/or cold/flu season	2	4.3
	Other reasons	1	2.1
Are there times when you tend to use your preventer (brown/steroid) inhaler more often?	Yes – during allergy/pollen season	8	17.0
	Yes – during cold/flu season	7	14.9
	Yes – during a flare-up/asthma attack	7	14.9
	Yes – other reasons	4	8.5
	No – there is no difference; I use my inhaler the same amount throughout the year	21	44.7
If you have been prescribed a combination (red and white) inhaler, are there times when you tend to use this in preference to the reliever (blue/SABA) inhaler?	Yes – during allergy/pollen season	5	10.6
	Yes – during cold/flu season	3	6.4
	Yes – during a flare-up/asthma attack	4	8.5
	Yes – other reasons	2	4.3
	No	33	70.2
Have you been given an asthma treatment plan by your healthcare professional?	Yes	21	44.7
	No	26	55.3

Abbreviations: SABA, short-acting β_2 -agonist; SMART, single maintenance and reliever therapy.

that less than half of the participants were using their preventer inhaler throughout the year. This may be appropriate if asthma is seasonal. Meanwhile, more than half the patients used the inhaler only during allergy or cold seasons, or during periods of asthma exacerbation. The study also identified that HCPs' prescribing behaviours play a role in adherence to

asthma medication, such as GPs prescribing the inhaler prescriptions to meet the patients' requirements rather than following a clinical guideline. This may be because the majority of prescriptions prescribed are requests for repeat prescriptions rather than the initial treatment. This suggests that further research is needed to identify the most effective approaches to promote medication prescription by HCPs and to educate patients about the importance of medication adherence in asthma control.

Previous studies have found that some patients are non-compliant with medication use when they are symptom free and only adhere to medication during symptomatic episodes.¹¹ A study from five European countries also found that when symptoms worsen, most patients increase SABA use, instead of evaluating the appropriateness of stepping up the maintenance medication.¹² Numerous studies indicate that adherence to the use of preventer medication by patients with asthma is poor worldwide,^{13,14} and has been associated with an increased socio-economic burden.¹⁵ There is also a tendency for patients to misjudge their condition and overestimate their management and symptom control.¹¹

The findings of our study also show that almost half of the HCPs did not schedule asthma treatment follow-up with their patients. Consequently, the lack of monitoring of asthma control will subsequently affect patients' medication adherence. Follow-up schedules have been proven to be effective by many studies, as these are one of the key components of asthma treatment and disease control.^{16–18}

Our study also found that eight out of 10 HCPs have prescribed repeated inhaler prescriptions because of a request by the patient. Previous studies have found that prescribing behaviours are associated with several factors, including inadequate HCP training on asthma management,¹⁹ the increased cost of maintenance therapy, the generalized definition of the disease, and the doctor–patient relationship.²⁰ Alerts on computerized support systems for repeat prescriptions can also influence GPs' prescribing behaviours.²¹ Furthermore, different guidelines and treatment approaches for asthma management may lead to the overuse of SABA and underuse of controllers.^{22–24}

Poor adherence is a major problem in asthma control, and results in increased hospitalization, mortality, and healthcare use and costs. One study identified that different determinants explained different reasons for non-adherence.²⁵ Therefore, identifying determinants of non-adherence can help HCPs to develop targeted interventions to reduce non-adherence. A number of trials designed to change patients' health behaviour showed that interventions such as sending a reminder message to the patient have the potential to improve disease monitoring and management.²⁶ Studies have also shown how developing a personalized self-management care plan for patients involving mobile technology interventions¹³ and, where feasible, annual reviews on inhaler use and technique is important for symptom management and control.^{15,27,28} However, despite extensive research on poor adherence and interventions, an ideal solution remains elusive and demands further research. For example, studies on understanding HCPs' and patients' perceptions and behaviours and the possible barriers to asthma treatment, including psychological dependence, are important.

Study Limitations

Using an online survey method to explore patients' and HCPs' views and experiences around their diagnosis and medication use has provided valuable insights into the motivation behind preferred inhaler use, and the potential challenges relating to medication non-adherence and prescribing practices. However, several important limitations of the study need to be addressed. Firstly, since the online survey was self-reported, responses may be inconsistent; this potentially leads to over- or under-reporting of SABA use and may cause misclassification of outcomes. Secondly, online data collection may help in reducing costs but tends to have high non-response rates. Our small sample size gave results which may not be sufficiently powered to detect differences between the groups. There are some potential reasons for the small sample size. Firstly, the online survey was self-selected, which may have caused the low response rate and the low completion rate. The second reason may be due to the fact that the surveys were distributed via CPRD; for patient data protection, our research team could not make any contact with or send a reminder to the potential respondents; in addition, we did not use any conjunction methods, such as web or emails, for survey collection, so the study only yielded a small sample size. The timing of the study may also have affected response rates, as the study was delayed for years because of COVID-19 and was distributed at a time when GP practices were still recovering their services. Thirdly, selection bias due to recruiting prescreened patient participants may have the potential to skew the results and reduce the generalizability of the study. To limit the chance of selection bias, the online survey was based on

randomly selecting respondents from the population of interest; furthermore, the respondents' characteristics could not be observed or known, which reduced the selection bias. Finally, we could not calculate the proportions of patients on SMART who used daily SABAs, as we do not have these data. This would be worth exploring in future studies.

Conclusions

We found that SABA and ICS prescription patterns are driven by a combination of HCP and patient factors. The findings indicate room for improvement in asthma control and SABA prescription practices, and suggest that there are opportunities for better targeted education for both patients and HCPs, leading to effective healthcare resource utilization and improved asthma control.

Ethical Approval

The data handling and storage complies with the General Data Protection Regulation (GDPR) guidelines. The Independent Scientific Advisory Committee (ISAC) granted approval for the study on 28 May 2020 (protocol number 20_085) to access anonymized primary care data through CPRD. HRA and Health and Care Research Wales (HCRW) approval was given for the study on 22 November 2021 (REC reference: 21/PR/1438). The study was conducted according to the guidelines of the Declaration of Helsinki. Informed consent was obtained from all patients participating in the study.

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