

ORIGINAL ARTICLE

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*Effective Clinical Practice.
2000;3:16–24.*

Edited by William C. Black, MD

• **See related editorial on
pages 40–44.**

Improving General Practice Care of Patients with Asthma or Chronic Obstructive Pulmonary Disease: Evaluation of a Quality System

CONTEXT. During the past decade, several guidelines on the management of chronic obstructive pulmonary disease and asthma have been developed. However, strategies for implementing these guidelines have not been systematically evaluated.

OBJECTIVE. To test a quality system intended to improve general practitioners' compliance with recently established guidelines.

DESIGN. Before–after study with concurrent controls.

UNIT OF ANALYSIS. 19 general medical practices in the Netherlands (14 intervention practices and 5 control practices).

INTERVENTION. A quality system with five components: identification of barriers, documentation, education, feedback, and peer review.

PATIENTS. Outpatients 16 to 70 years of age with asthma or chronic obstructive pulmonary disease.

MEASUREMENTS. The number of consultations for respiratory symptom monitoring, measurement of peak expiratory flow rate, prescription of anti-inflammatory agents, monitoring of medication compliance and inhalation technique, and influenza vaccination.

RESULTS. The percentage of patients who had two or more consultations per year increased significantly in the intervention practices (median, 27% of patients before the intervention vs 82% of patients after the intervention; $P < 0.01$), as did the percentage of patients who had at least one measurement of peak expiratory flow rate (median, 10% of patients before the intervention vs 84% of patients after the intervention; $P < 0.01$). The percentage of patients who received a prescription for anti-inflammatory agents did not increase significantly. No significant changes were seen in the control practices. Physicians in the intervention practices were more likely to monitor medication compliance and inhalation technique. No difference was found in frequency of influenza vaccination.

CONCLUSION. The quality system improved guideline compliance in some areas but not in others.

In the Netherlands, the general practitioner is the gatekeeper of the health care system; he or she is able to deliver continuous care because patients have the same physician for many years. Patients with asthma or chronic obstructive pulmonary disease (COPD) usually receive a diagnosis and are managed in general practice.

The abstract of this paper is available at ecp.acponline.org.

However, shortcomings have been reported in the care that physicians provide to patients with these disorders.¹⁻⁴ In the past decade, the recommended treatment of patients with asthma or COPD has become increasingly standardized. Many guidelines have been published, including those issued by the Dutch College of General Practitioners.⁵⁻¹¹

However, the implementation of such guidelines has not been thoroughly evaluated. Barritt and Staples¹² and Tse and coworkers¹³ found that adherence to the guidelines improved the process of care for patients with asthma: Use of lung function tests, prescription of inhaled corticosteroids, and development of written action plans increased. However, Barritt and Staples studied only one practice, and Tse and coworkers assessed physicians' general management of asthma. In a randomized clinical trial, Feder and colleagues¹⁴ found that the number of consultations and the prescription of anti-inflammatory agents increased in practices that used treatment guidelines; in contrast, adherence to such guidelines only marginally affected the frequency with which physicians recorded key data in the medical records.

Publication of guidelines is not enough to change clinical practice. To modify the behavior of general practitioners, guidelines should be accompanied by intensive implementation strategies.¹⁵⁻¹⁷ Combined implementation strategies seem to be more effective than single strategies in improving quality of care.¹⁸ To improve physicians' ability to deliver care to patients with asthma or COPD according to the Dutch College of General Practitioners' guidelines, we implemented a quality system that used the following components: identification of barriers, documentation, feedback, education, and peer review. We examined the ways in which the care given to patients with asthma or COPD changed after implementation of the quality system.

Methods

Study Design and Participating Practices

We designed a nonrandomized, before–after study with a comparable control group. The quality system was implemented in a group of 14 general practices that were located in the northwestern region of the Netherlands and included 16 physicians; these practices were the intervention practices. We compared guideline compliance in the year before implementation of the quality system with that in the first year of implementation.

To control for external factors, guideline compliance in the intervention practices was compared with compliance in five control practices that continued to provide their usual care. The control practices, which

included five physicians, were located in the same region as the intervention practices. **Table 1** shows the characteristics of the intervention and control practices.

Patients

Physicians in the intervention practices recruited 455 patients between June 1993 and April 1994. Physicians in the control practices recruited 152 patients between March 1994 and July 1994. The mean number of patients per practice was 32 (range, 16 to 64). Patients were included if they were between 16 and 70 years of age, had received a diagnosis of asthma or COPD from their physician, were not under the care of a chest physician, had no disease expected to influence short-term survival, had no other disease that affected lung function, and agreed to participate.

Guidelines

General practitioners at the EMGO Institute prepared further details of the guidelines issued by the Dutch College of General Practitioners.^{10,11} In these elaborated guidelines, the indications for some aspects of care (e.g., when and how prescribed medication should be adjusted) were described in more operational terms than in the Dutch College of General Practitioners guidelines. **Table 2** shows a summary of the guidelines and the quality of evidence that supports them. The physicians in the intervention group received the elaborated guidelines before they selected patients.

TABLE 1
Characteristics of Intervention and Control Practices

CHARACTERISTIC	INTERVENTION PRACTICES (n = 14)	CONTROL PRACTICES (n = 5)
Practice		
Solo	50%	60%
Location		
City	43%	60%
Small city	43%	20%
Rural area	14%	20%
Physician		
Number	16	5
Mean age \pm SD	41 \pm 5 yr	43 \pm 5 yr
Mean time working as a general practitioner \pm SD	11 \pm 7 yr	13 \pm 4 yr
Works part time	43%	20%
Attended a course on asthma or COPD* care in the past 2 years	50%	60%

*COPD = chronic obstructive pulmonary disease.

TABLE 2

Guidelines for Care of Patients with Asthma and Chronic Obstructive Pulmonary Disease

PERFORMANCE MEASURE	GUIDELINE	QUALITY OF EVIDENCE*	CRITERIA USED FOR COMPLIANCE
Follow-up visits	Should take place every 6 months for well-regulated patients; more often for patients using anti-inflammatory agents or anticholinergic agents and for those who have troublesome symptoms [†]	III	Two or more consultations to monitor respiratory symptoms
Measurement of peak expiratory flow rate	Should be done during all consultations used to monitor respiratory symptoms	III	At least one measurement of peak expiratory flow rate
Anti-inflammatory agents	Should be prescribed for patients who use bronchodilators >2 times per day and for those who have troublesome symptoms [†]	I ¹⁹⁻²¹	Prescriptions
Monitoring of medication compliance	Should be done for all patients using inhalation medication	III	At least one time for patients using inhalation medication
Monitoring of inhalation technique	Should be done for all patients using inhalation medication	II ²²	At least one time for patients using inhalation medication
Influenza vaccination	Should be done yearly for all patients	III	Vaccinations given during the intervention year
FEV ₁ measurement	Should be done in all patients with troublesome symptoms [†]	III	At least one time for patients with troublesome symptoms
Advice to stop smoking	Should be given to all patients who smoke	I ²³	At least one time for patients who smoke

*As rated by the authors of this paper. I = evidence obtained from at least one properly randomized clinical trial; II = evidence obtained from well-designed, controlled trials without randomization or cohort or case-control studies; III = opinions of respected authorities, based on clinical experience.

[†]Sleeping disorders due to respiratory symptoms, respiratory symptoms that interfere with normal daily activities, or frequent respiratory problems.

Quality System

In 1993, the intervention practices introduced a quality system that was directed toward daily implementation of the guidelines. The quality system involved a combination of the following components: identification of barriers, documentation, education, feedback, and peer review (Figure 1). We used questionnaires to identify the barriers and problems that physicians expected to encounter when adhering to the guidelines. These barriers and problems received special attention in the quality system. Documentation of the main aspects of diagnosis and treatment on standardized forms was an essential aspect of the quality system because it reminded physicians to work in accordance with the guidelines and allowed us to provide feedback data.

Beginning in October 1993, eleven 90-minute educational meetings were held in a 15-month period. Controversial guideline recommendations (e.g., frequen-

cy of lung function measurements and regular follow-up visits) were discussed, sometimes with experts in the field of asthma and COPD. Participants exchanged practical advice on implementing appointment systems. During each meeting, physicians received personal feedback on the care that they had provided for their patients; the feedback was related to the topic being discussed. In addition, peer review²⁴ was used to share experiences, to gain support from colleagues, and to discuss the discrepancies between the recommendations given in the guidelines and the actual care provided.

Measurements

From the medical records of each patient, we collected data on the number of consultations and measurements of peak expiratory flow rate that occurred one year before and 1 year after the study began. Two

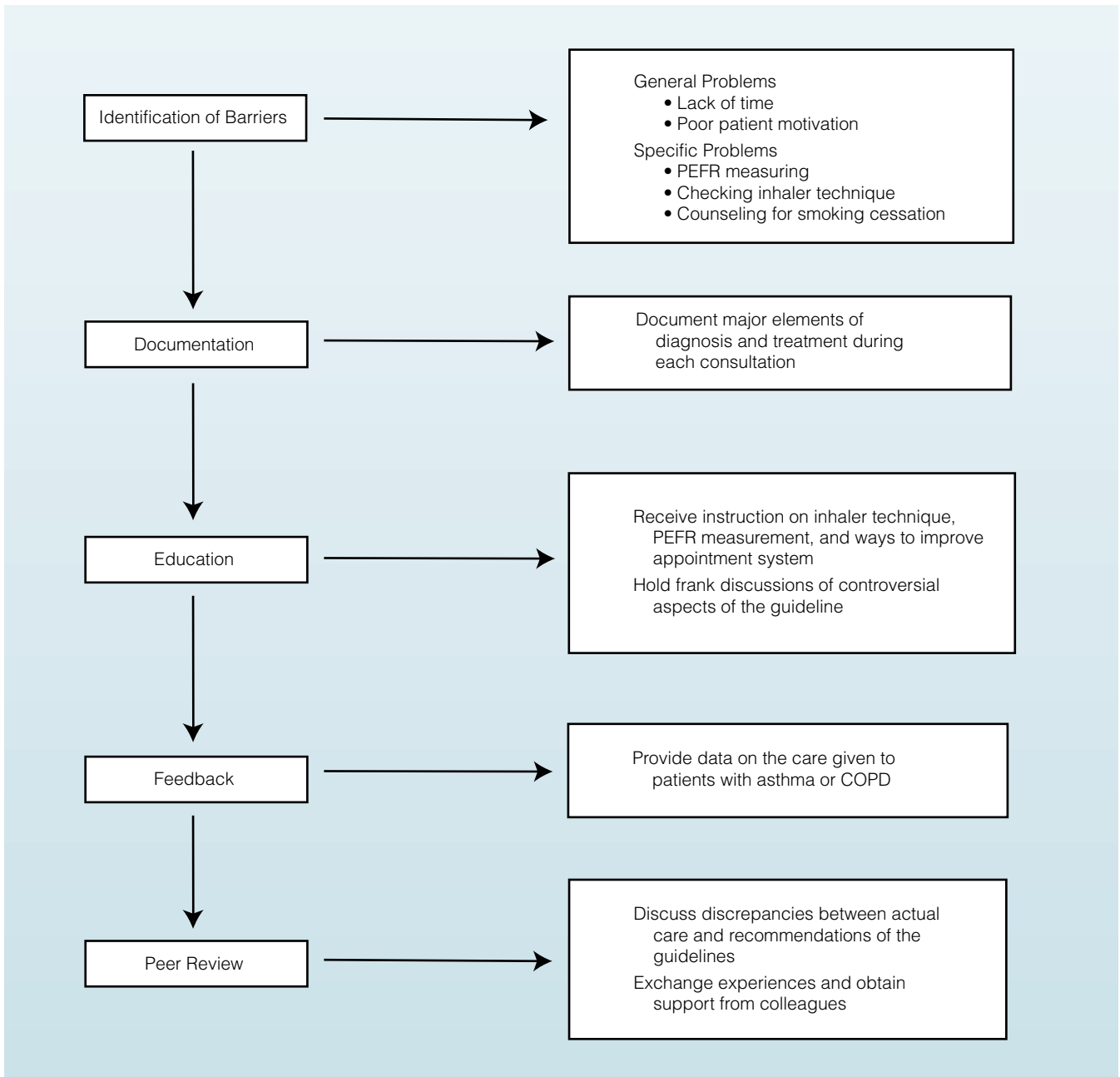


FIGURE 1. The components of the quality system in the 14 intervention practices. COPD = chronic obstructive pulmonary disease; PEFR = peak expiratory flow rate.

researchers used the medical records to retrospectively determine the number of consultations held for respiratory symptom monitoring and the number of consultations held for other reasons. Notes regarding requests for renewed prescriptions that did not involve a conversation with the physician were not considered consultations. We used the same method to determine whether the physician measured peak expiratory flow rate in the year before and the year after the study began. Data on whether physicians monitored medication compliance and inhalation technique, administered the influenza vaccine, measured FEV₁, and

advised patients to stop smoking were available only for the year after the study began and were collected by patient questionnaire.

At the time of patient enrollment, a physician from the intervention practices and a researcher from the control practices recorded data on each patient regarding prescribed medication, smoking habits, age at disease onset, and presence of troublesome symptoms (sleeping disorders due to respiratory symptoms, respiratory symptoms that interfered with normal daily activities, or frequent respiratory problems). Data on prescribed medication were recorded again 1 year later.

Because the guidelines of our department recommend that consultations take place at least every 6 months, we used the percentage of patients who had visited their physician at least twice per year as one of the outcome measures. When we determined the frequency with which physicians measured peak expiratory flow rate, monitored medication compliance, monitored inhalation technique, measured FEV₁, and advised patients to stop smoking, we did not include data involving patients who had not visited their physicians in the year after the study began; it was impossible for the physician to address these items of care in these patients.

Because the practices were the subjects of the intervention, the outcome measures were calculated at practice level. These calculations were performed only if all practices had at least four patients to whom the specific item of care should have been applied. Data from all patients whose medical records were available at the end of the study were included in the analyses. Data on whether the physicians monitored medication compliance and inhalation technique, administered the influenza vaccine, measured FEV₁, and advised patients to stop smoking were collected only from patients who completed the questionnaire.

Statistical Analyses

For both groups, we calculated the median and range of the percentages of patients per practice to whom each item of care had been applied. In the intervention practices, the changes in the outcome measures were tested on practice level by using Wilcoxon tests for paired data. The differences in the outcome measures between intervention practices and control practices were tested at practice level by using Mann–Whitney tests with exact probabilities; this statistical method is recommended when the unit of allocation is a practice instead of a patient and the number of practices is small.²⁵ We used the same test to determine the differences in the change of the outcome measures between both groups with regard to the items that were measured before and after the study began.

Results

Data from the medical records were available for 427 (94%) of the patients in the intervention practices and 146 (96%) of the patients in the control practices. Data were missing for patients who had moved or who were no longer willing to participate. Two hundred seventy-seven (61%) of the patients in the intervention practices and 109 (72%) of the patients in the control practices completed the questionnaire. Patients who did not complete the questionnaire were younger, more likely to

smoke, and less likely to have been prescribed anti-inflammatory agents than those who did.

Few differences in patient characteristics at baseline were observed between the intervention and control practices. Compared with the patients in the control practices, patients in the intervention practices were more likely to report troublesome symptoms and to have asthma (Table 3).

Changes in the Practices

As shown in Figure 2, the percentage of patients in the intervention practices who had two or more consultations per year to monitor respiratory symptoms increased significantly after the quality system was implemented (median, 27% of patients before the intervention vs. 82% of patients after the intervention; $P < 0.01$). Similarly, the percentage of patients who had at least one measurement of peak expiratory flow rate increased significantly after the quality system was introduced (median, 10% of patients before the intervention compared with 84% of patients after the intervention; $P < 0.01$). Although the percentage of patients who were prescribed anti-inflammatory agents increased, the change was small and not significant

TABLE 3
Patient Characteristics at Baseline in the Intervention and Control Practices

CHARACTERISTIC	INTERVENTION PRACTICES (455 PATIENTS)	CONTROL PRACTICES (152 PATIENTS)	P VALUE FOR BETWEEN-GROUP COMPARISONS
Age			
16–19 yr	8%	6%	
20–29 yr	17%	19%	
30–39 yr	18%	22%	> 0.2
40–49 yr	28%	24%	
50–59 yr	13%	14%	
60–70 yr	16%	15%	
Sex (male)	39%	41%	> 0.2
Smoking	36%	32%	> 0.2
Troublesome symptoms†	61%	51%	0.04
Type of disease			
Asthma	73%	61%	< 0.01
COPD*	27%	39%	

*COPD = chronic obstructive pulmonary disease.

†Sleeping disorders due to respiratory symptoms, respiratory symptoms that interfere with normal daily activities, or frequent respiratory problems.

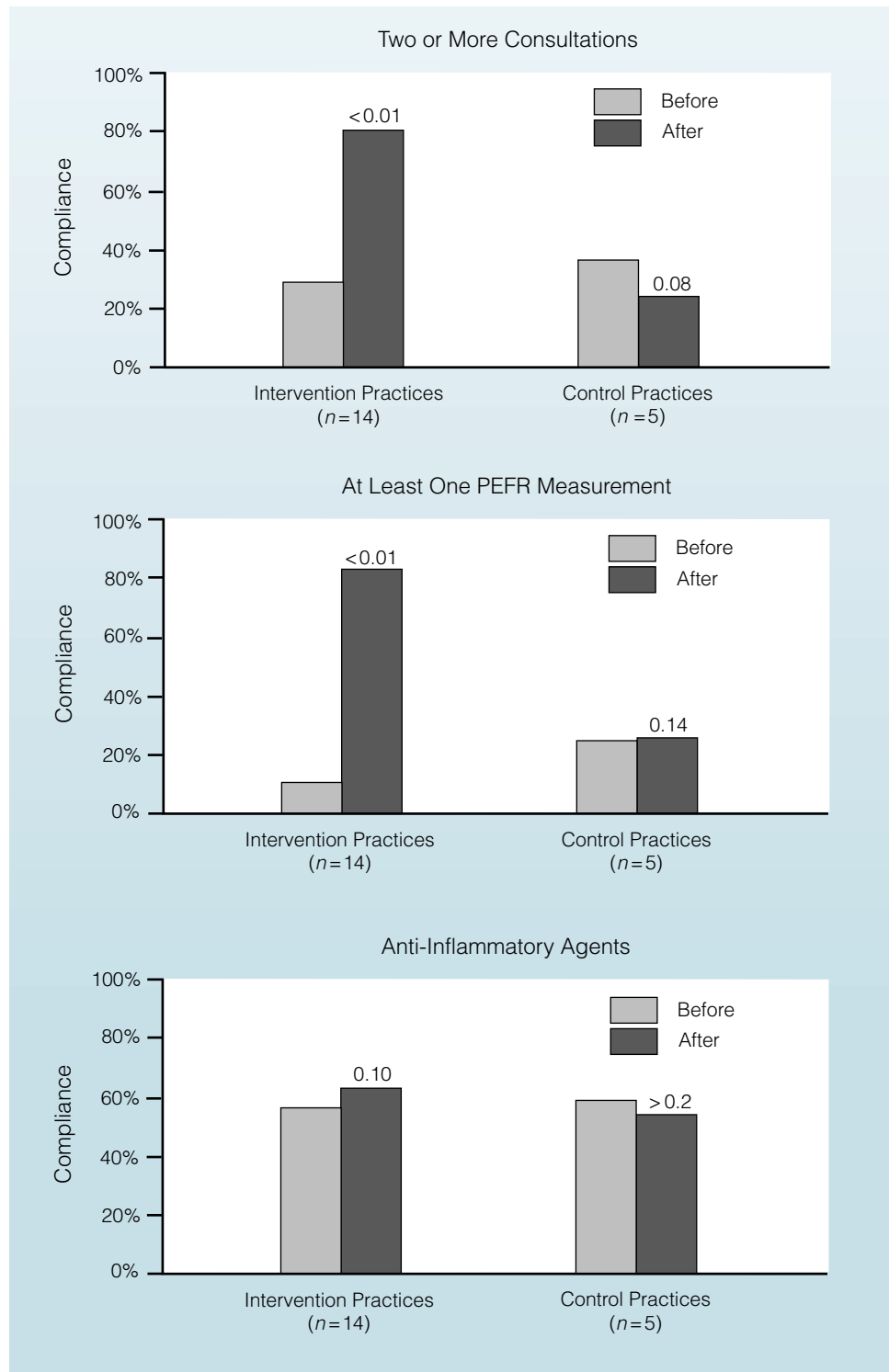


FIGURE 2. Comparison of intervention and control practices before and after introduction of the quality system. The median rates of compliance with the guidelines are shown. *P* values are for the before–after within group difference. PEFR = peak expiratory flow rate.

when analyzed at practice level. No significant changes were found across time in the control practices.

Differences between the Intervention and Control Practices

During the year before the start of the study, the intervention and the control practices did not differ in terms of the percentage of patients who had had two or

more consultations, the percentage of patients who had had at least one measurement of peak expiratory flow rate, and the percentage of patients who had been prescribed anti-inflammatory agents ($P > 0.5$). After 1 year, the change in the percentage of patients who had at least two consultations and the change in the percentage of patients who had at least one measurement of peak expiratory flow rate were significantly greater in

the intervention practices than in the control practices ($P < 0.01$ for both items) (Figure 2). In the intervention practices, the median of the mean number of consultations used to monitor respiratory symptoms per patient per practice increased from one to three; in the control practices, it decreased from two to one. The median of the mean number of consultations for other reasons remained stable in both groups (three consultations per year). The change in the percentage of patients who had a prescription for anti-inflammatory agents did not differ significantly between the two groups ($P = 0.11$).

During the year in which the quality system was implemented, the physicians in the intervention practices monitored medication compliance and inhalation technique more often than the physicians in the control practices (Table 4). No significant difference was found in frequency of influenza vaccination. We could not evaluate the frequency with which physicians measured FEV₁ and advised patients to stop smoking at the practice level because these outcomes measures applied to too few patients per practice. At the patient level, however, more persons who smoked in the intervention practices (84%) than in the control practices (59%) stopped smoking or had been advised to stop smoking.

Time Investment

In the intervention practices, the estimated mean increase in the time spent consulting patients with asthma and COPD was 9 hours per practice per year.²⁶ In addition, physicians attended a mean of 7 of 11 educational meetings of 1.5 hours each (range, 4 to 11 meet-

ings) and spent an average of 4 hours selecting patients, reading the guidelines, and completing the documentation forms. When we included in our analysis only physicians from intervention practices who had attended at least half of the educational meetings, our results did not change significantly.

Discussion

Our findings show that the implementation of a quality system improved physician compliance with several recommendations given in guidelines on management of patients with asthma and COPD. The number of follow-up visits clearly increased. Regular consultations are important for the optimal care of these patients and guideline recommendations not measured in this study should also be applied to them.

We found that the increase in the number of consultations to monitor respiratory symptoms was not accompanied by an increase in the number of consultations for other reasons, which indicates that more consultations for patients with asthma and COPD does not automatically lead to more consultations for other conditions. This is encouraging because some experts, particularly in the Netherlands, are concerned that patients who receive frequent consultations for specific conditions may come to depend on constant medical attention.

It will be expensive to increase the number of consultations to monitor respiratory symptoms and to prescribe anti-inflammatory agents more frequently. However, in the long term, these costs will probably be offset by lower costs for exacerbations and hospitalization. Further research on cost-effectiveness is needed to study these hypotheses.

TABLE 4

Performance during the Year after Introduction of the Quality System

PERFORMANCE MEASURE	INTERVENTION PRACTICES (n = 14)	CONTROL PRACTICES (n = 5)	P VALUE FOR BETWEEN-GROUP COMPARISONS
Monitoring of medication compliance*	61% (42%–78%)	50% (9%–64%)	0.07
Monitoring of inhalation technique*	42% (23%–61%)	21% (0%–45%)	0.06
Administration of influenza vaccine*	61% (42%–81%)	50% (20%–82%)	>0.2
Patient subgroups†			
FEV ₁ measurement done in patients who had troublesome symptoms at study inclusion	30%	19%	
Advice to stop smoking given to patients who smoke	84%	59%	

*Median practice and the range for practices.

†Assessment was made on the basis of patient-level data: too few patients were available to evaluate at practice level.

The average time investment of 24 hours per physician might have reduced the quality of care for other medical conditions; however, it could be argued that introduction of the quality system might have allowed physicians to provide structured care to patients with other types of chronic illnesses.

The guidelines on the management of patients with asthma and COPD are based mainly on consensus, not on empirical evidence. Although physicians might be expected to adopt methods of care that have been proven to be effective,²⁷ this was not found in our study.

By obtaining information from medical records, we risked underreporting delivery of care.^{28, 29} We compared the data obtained from the medical records with the data obtained from the documentation forms that physicians from the intervention practices completed during all consultations. Both data sources yielded the same number of consultations for respiratory symptom monitoring. However, the documentation forms showed that the peak expiratory flow rate of all patients in the intervention practices had been measured at least once, which indicates some degree of underreporting in the medical records.

Many patients did not complete the patient questionnaire. Those who did were older, less likely to smoke, and more likely to be prescribed anti-inflammatory agents. Because older age and receipt of a prescription for anti-inflammatory agents were associated with greater physician compliance with the guidelines,²⁶ the high rate of noncompletion may have caused us to overestimate the effect of the quality system on physicians' monitoring of medication compliance and inhalation technique.

Data were not available on hospitalization of patients for asthma or COPD. However, we believe that the number of hospitalizations was very low because only 2% of the patients in the intervention practices and 8% of the patients in the control practices visited a chest physician during the study year.

Summary

The quality system seems to be an effective way to implement guidelines on the management of patients with asthma and COPD in general practice. We believe that greater compliance with the guidelines related to the outcome measures improved quality of care, although we realize that quality of care depends on much more than the application of the items mentioned in this study. The quality system demanded a substantial amount of time and effort from physicians and from support staff; therefore, additional research should be done to obtain insight on whether a less intensive approach would produce the same effects. Further research is also needed to assess the long-term effect of the quality system on the process of care and on health outcomes.

Take-Home Points

- Although several guidelines on management of patients with asthma and COPD have been developed, their implementation has not been studied.
- We assessed compliance with established guidelines in 14 clinical practices before and after implementation of a quality system (which included identification of barriers, documentation, education, feedback, and peer review) and in 5 control practices.
- The quality system significantly increased the proportion of patients who had peak expiratory flow rate measurements and follow-up visits for respiratory symptom monitoring; however, it did not significantly increase the use of anti-inflammatory agents.
- The quality system demanded considerable time and effort from physicians and support staff.
- Further research is needed to determine whether similar improvements in guideline compliance can be obtained with a less intensive intervention and to confirm that these process improvements result in better health outcomes.

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Acknowledgment

The authors thank the general practitioners and practice assistants who participate in the Vrije Universiteit's Extramural Clinic for their cooperation in this study and for the kind hospitality shown to the researchers during their visits to the practices.

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