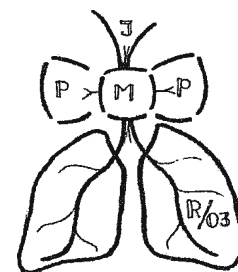


Complex pharmaceutical care intervention in pulmonary care

Part A. The process and pharmacists' professional satisfaction

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Key words

Asthma
COPD
Drug-related problems
Guidelines
Patient medication records
Pharmaceutical care process
Pharmacist satisfaction
The Netherlands

Abstract

Objective: In the IPMP study (Interventions on the principle of Pulmonary Medication Profiles), tailored pharmaceutical care interventions were provided to pulmonary patients selected because of drug use that deviates from Dutch guidelines. The aims were to solve drug-related problems and to improve patients' drug use. This article describes the pharmaceutical care process tailored to the individual problems of patients in the intervention arm of a randomized controlled trial and defines the package of care.

Method: After a preliminary selection of the patients with the help of the algorithmic IPMP computer instrument, instructed Dutch community pharmacists had structured consultations with patients (aged 13–70 years) in the intervention arm to identify behaviour and specific problems with their medication. Based on this identification process, a tailored intervention was constructed that could comprise one or more of six pharmaceutical care modules. Modules were clustered in sets describing the complete programme of care provided to one patient. If necessary, pharmacists consulted the patients' physicians to improve the prescribed therapy. After the interventions, medication changes were evaluated with the patients. The prescribed medication and the refill rate were monitored in the pharmacy computer during 1 year. All activities and results were extensively monitored and documented.

Main outcome measure: Process description, i.e. number of provided pharmaceutical care modules and medication changes. Pharmacists' satisfaction.

Results: Tailored interventions were provided to 199 patients at risk of sub-optimal drug therapy. In all 813 pharmaceutical care modules were performed and documented, and clustered in four different programmes. In addition to education and motivation to adhere to prescribed medication for all 199 patients, a medication change was suggested in 124 cases. Patients and physicians agreed upon a change in 94 cases. Device change was agreed upon in 58 of 64 cases, often simultaneously with medication change. Pharmacists consulted physicians concerning 100 patients. Pharmacists reported satisfaction with the pharmaceutical care approach.

Conclusion: Because of the extensive documentation, interventions could be described completely. Pharmacists observed a better drug use after educating patients or by solving their drug-related problems. In collaboration with physicians drug treatment could be improved.

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Introduction

The treatment of pulmonary diseases is not always standard, and in addition some patients use their pulmonary medication sub-optimally for different reasons. Non-compliance to prescribed medication can be caused by insufficient knowledge about the prescribed drug, the inhaler, or the disease¹. Moreover, medication should be prescribed according to (inter)national pulmonary guidelines^{2–5}. It is obvious that sub-optimal drug treatment does not lead to optimal effect or a favourable long-term prognosis⁶.

By using pharmaceutical care protocols, pharmacists are able to support their patients during long-term pulmonary drug use, and improve drug adherence, thus achieving the optimum efficacy with as few as possible or no adverse effects⁷.

There are a number of studies aiming at improving adherence by pharmaceutical care provided to pulmonary patients. They showed positive results concerning inhaler technique or knowledge about medication and pulmonary diseases such as asthma and COPD (chronic obstructive pulmonary disease)^{8–12}. In the European TOM (Therapeutic Outcome Monitoring) studies, Herborg and others considered both physicians and patients to be active participants in their pharmaceutical care projects. In these studies not only isolated factors such as knowledge, skills, compliance to prescription guidelines or self-management, but also the quality of drug therapy and the overall health status^{13–17}, were improved. Pharmaceutical care is composed of various supportive activities and demands a tailor-made approach^{18,19}.

Dutch pharmacists have computerized medication histories with an almost complete overview of the patients' medication prescribed by different physicians and specialists^{20,21}. From these databases they can select groups of patients with drug use which deviates from the Dutch guidelines^{22–24}. They can also detect the medication problems of the individual patients by reviewing their drug use profiles (DUPs).

DUPs give pharmacists the opportunity for an individualistic approach to solve specific drug-related problems, in some cases in collaboration with the patients' physician. Dutch pharmacists have experience in consulting physicians concerning individual patients' medication as a consequence of medication surveillance²⁵.

The research presented here is a part of the IPMP (Interventions on the principle of Pulmonary Medication Profiles) study, which aims at investigating the efficacy of Dutch pharmacists providing pharmaceutical care to individual patients concerning the treatment of their pulmonary disease and the use of their medication. The IPMP study has a randomized controlled design at patient level, but in this article we focus on the intervention arm.

The IPMP intervention strategy can be considered as a complex intervention²⁶. This article describes the individualized analyses and the tailored interventions by pharmacists, defines the package of care and describes the collaboration of pharmacists with other health care professionals. Patients' opinions and evaluation of the complete intervention are described in a separate article²⁷.

Methods

Outline of the IPMP intervention

In the years 2001–2002, a prospective intervention study was performed on the effect of Dutch community pharmacists providing pharmaceutical care to pulmonary patients.

Patients were identified and selected by an algorithmic computer instrument checking pulmonary drug use that deviated from Dutch guidelines. Consultations with patients were guided by consultation protocols tailored to 10 different medication profiles. On the basis of the results of these consultations, six different pharmaceutical care modules could be applied to support the intervention. The complete period of intervention and follow-up of the involved patients was 1 year.

Participating pharmacists

Pharmacists in 24 Dutch community pharmacies volunteered to participate in the IPMP study. All pharmacies had computerized pharmacy information systems registering all prescriptions dispensed to individual patients. Patients' medication records were kept for at least 6 years. All pharmacists performed medication surveillance prior to dispensing. Pharmacists commonly gave instruction to their patients on how to handle a new inhaler and provided information about new medicines. Pharmacies were equipped with separate rooms for these patient consultations. All pharmacists had regular meetings with general practitioners (GPs) to discuss new medicines, drug-related problems and pharmacotherapy (academic detailing). The pharmacists were familiar with reviewing drug-use profiles based on patients' medication records and with discussing drug use with the patient or the prescribing physician. All these activities – which we call usual care – were investigated using a structured questionnaire before the start of the study.

Training and support of the participating pharmacists

Five educational meetings were held to inform and teach participating pharmacists during the IPMP study. Subjects discussed were: how to review patients with drug-use that deviates from guidelines, how to invite them for consultation and counselling, and how to help patients to discover and solve drug-related problems. Experts and researchers in the field of pulmonary diseases, pharmacotherapy, communication and inhalation technique gave lectures and organized workshops. During these meetings, problems and limitations could be discussed multidisciplinary. Complete background information was developed and a manual was distributed.

Patient selections

Coded patient medication records of the participating pharmacies concerning the year 2000 were scrutinized by the researchers using the algorithmic IPMP computer instrument²⁸. Ten selection profiles as indicators for drug use that deviates from Dutch guidelines are described in Table 1.

Researchers selected a maximum of 60 patients (13–70 years of age) per pharmacy. Within each pharmacy, researchers randomly allocated selected patients to the intervention or the reference group (shown in Figure 1).

In February 2001, participating pharmacists received the anonymous codes of selected patients belonging to the intervention arm. On the basis of the developed IPMP protocol they reviewed patients' drug use profiles (DUPs) to consider whether an invitation for a consultation would be profitable to these patients at that moment.

In order to ensure that reference patients received usual care (as explained under participating pharmacists) the pharmacists were not informed of their identity.

Tailored intervention

To start the intervention, pharmacists invited the patients with drug use which currently deviated from guidelines through letter and through telephone to a consultation in the pharmacy. Written informed consent was obtained with the documentation of anonymous details of the consultations, of further provided interventions and of their drug use.

The consultations were guided by protocols tailored to one of the 10 different medication profiles. The consultation protocols were set up in such a way that existing additional drug-related problems could be identified²⁹. Specific patient data (shown in Table 2) were collected and documented.

To solve the identified drug-related problems after evaluating all aspects of the consultation protocol, six different pharmaceutical care modules were developed for the IPMP study as shown in Box 1. If necessary, pharmacists consulted the patients' physician to improve the prescribed therapy. All modules were supported by protocols and had forms to document activities, agreements, individual aims and results.

Follow-up

Four weeks after the consultation and the provided pharmaceutical care, pharmacists evaluated patients' experiences by telephone or during a visit in the pharmacy. Insufficient improvement or unreached aims might be a reason for a new consultation or an additional counselling of the GP or pulmonologist. The episode was concluded when the individual aim was achieved. After this first part of the intervention, the patients' drug treatment and the refill rate of the prescriptions were monitored by reviewing the medication records every 3 months. Irregularities in the predicted refill rate could be a reason to contact the patient again or to start a new intervention episode. After 1 year the patient was invited to a final consultation to evaluate the whole intervention and to bring it to a conclusion. The sequence of all parts of the intervention is summarized in Figure 1.

Table 1 Selection profiles according to the IPMP computer instrument²⁸

Selection Profile	Description of the selection profile: (expressed as the average use over a one-year period)	Number of profiles ^a
X	Disproportionately high use of any drug by inhalation (>950 DDDs)	33
A	Daily use of >2 inhalations of short-acting beta-2 agonists without corticosteroids by inhalation	26
B	Daily use of >2 inhalations of short-acting beta-2 agonists with low dosage or no concurrent use of corticosteroids by inhalation	64
C	Daily use of >2 inhalations of short-acting beta-2 agonists with low dosage or no concurrent use of corticosteroids by inhalation; also using long-acting beta-2 agonists	13
E	Long-acting beta-2 agonists without corticosteroids by inhalation	8
F	Long-acting beta-2 agonists without concurrent use of corticosteroids by inhalation	12
D1	Daily use of >2 inhalations of short-acting beta-2 agonists with daily use of corticosteroids by inhalation without long-acting beta-2 agonists	25
D2	Daily use of >2 inhalations of short-acting beta-2 agonists with daily use of corticosteroids by inhalation and long-acting beta-2 agonists	8
G	Oral adrenergics	1
H	Long-acting beta-2 agonists with concurrent use of corticosteroids by inhalation, but without fast-acting rescue medication	9

^aNumber of selection profiles of 199 identified patients

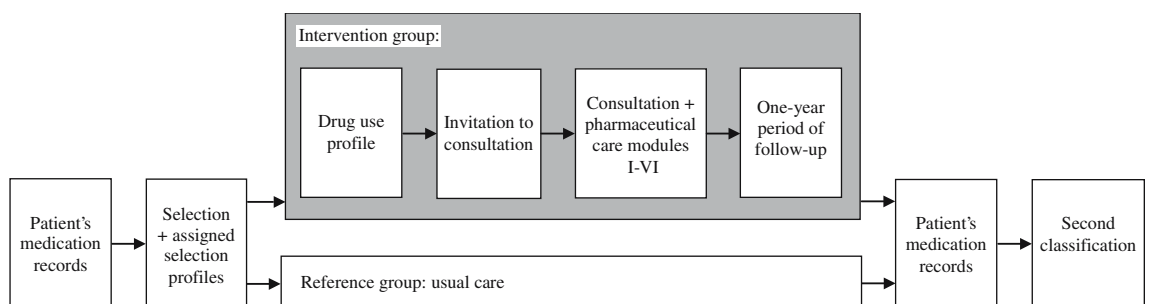


Figure 1 The sequence and structure of the IPMP study. The IPMP interventions are shown in the shaded rectangle.

According to the study-protocol, the pharmacists informed the researchers about the progress of their activities every 3 months. Problems or limitations could be discussed at any time.

Satisfaction survey

In August 2001 all participating pharmacists received a questionnaire to investigate possible problems and limitations or successes in performing this type of patient care.

Data analysis

All coded forms recorded by the pharmacists were entered in an Access 2000 database (version 9.0). Data were analysed by calculation of frequencies.

Pharmaceutical care modules clustered in programmes

Because pharmacists could provide pharmaceutical care by administering various activities, the six men-

tioned pharmaceutical care modules were clustered in four programmes indicating the complete intervention. In this way, one programme defined the package of care provided to each patient in the 1-year study period. Module VI (self-management) could be additional to all four programmes.

Pharmaceutical care modules clustered in programmes to indicate the package of care:

- 'Basic programme' is composed of modules I, II and III.
- Programme 'Device change' is composed of the 'basic programme' and module IV.
- Programme 'Drug change' is composed of the 'basic programme' and module V.
- Programme 'Device and drug change' is composed of modules I to V.

Table 2 Characteristics of 199 involved patients before intervention

Subject reported by patients	Description	Patients	
		Number	%
Reason for medication	Asthma	128	64
	Asthma and COPD	37	19
	COPD	28	14
	Other reason	4	2
	Unknown	2	1
Consultations related to pulmonary diseases with pulmonologist or physician in the year 2000	Regular annual contact with pulmonologist	42	21
	Regular annual contact with GP	33	17
	Only incidental contact in 2000	28	14
	No consultations with physicians in 2000	89	45
	Unknown	7	3
Smoking habits	Yes	94	47
	No, stopped smoking	37	19
	No, never smoked	41	21
	Unknown	27	13
Drug-related problems*	Not satisfied with the medication	27	13
	Treatment insufficient	62	31
	Perceived adverse effects	46	23
	Fear of side effects	17	9
	Fear of decreasing effectiveness by long- term treatment	32	16
	Shame to inhale medication	28	14
	No problems reported	73	37
Problems in medication use observed by pharmacists	Measure	Patients	
		Number	%
Inhaler technique	Sufficient	106	53
	More or less sufficient	32	16
	Not sufficient	42	21
	Unknown	19	10
Knowledge when multi dose inhaler is empty	Not sufficient	19	10
Knowledge about prescribed medication	Sufficient	79	40
	More or less sufficient	24	12
	Not sufficient	83	42
	Unknown	13	6
Adherence to medication use as prescribed	Yes	64	32
	More or less	43	22
	No	82	41
	Not completed	10	5

*Patients could mention more than one problem.

Results

Participating pharmacists

In 24 pharmacies 27 community pharmacists participated in the IPMP study. They had practical experience from 1 to 30 years (3 years on an average). Both genders were equally represented.

Patients

Researchers randomly allocated 554 selected patients to the intervention group. After reviewing the medication records the pharmacists invited 449 patients for a consultation, of whom 245 accepted the invitation. From 46 patients informed consent was not received, resulting in 199 patients (44%) whose interventions are described in this article.

Of the remaining 204 patients 44 were not eager to come to the pharmacy and 160 did not respond.

Each pharmacist provided pharmaceutical care interventions to between 4 and 16 patients.

The study population of 199 patients consisted of 118 women and 81 men with mean ages of 44.9 (SD 11.9) and 45.4 (SD 12.1), respectively. Compared to the characteristics of the entire intervention arm this sample consisted of more females (5%) and older (2.2 years) persons.

The number of persons per selection profile is shown in Table 1.

Consultation

Using the tailored consultation protocols, pharmacists discovered the most likely reason for the prescribed medication and its use.

Box 1 *Pharmaceutical care modules provided by pharmacists in the IPMP study*²⁹

Module I (Inhaler technique) checks patient's use of the inhaler and the knowledge of the properties of a device using the validated Dutch NODE protocols³⁰. This module also implicates improving incorrect use, education and suggestion to replace the device by a more appropriate one.

Module II (Dosage adjustment) involves the quantity of the used drugs: either daily use or rescue-medication and evaluation of the dose. The pharmacist may support the patient in proper usage of the prescribed medication or usage corresponding with the severity of the symptoms reported by patients.

Module III (Knowledge and adherence) checks the knowledge of used medication and comprises education tools (information leaflets, artificial trachea) for the patient to improve the adherence, especially to the daily use of corticosteroids by asthma patients.

Module IV (Adapting inhaler) describes changing a device by the pharmacist himself or in co-operation with the prescribing physician, depending on the local agreements between GPs and pharmacists. Criteria may be observed improvement compared to the former device, preference of the patient, replacement by already familiar devices and in case the medicine is withdrawn.

Module V (Treatment change) describes a suggestion to change the dose of a drug or to add another drug to the treatment to relieve symptoms or to benefit drug use according to the Dutch guidelines of the treatment of asthma or COPD. This module implies consulting the physician or pulmonologist to propose this change, to ask for the diagnosis and to start the altered treatment.

Module VI (Supporting self management) involves the principles of self management of asthma. In the IPMP study the pharmacist does not start self-management but can support patients already familiar with this kind of drug use.

Patients' characteristics are shown in Table 2: pharmacists assessed that the reason for medication was asthma-related in 83% of the patients. COPD was mentioned in 14% of the patients.

In total 117 patients (59%) reported that they did not see their physician on a regular basis and that they ordered their prescriptions by telephone.

Smoking habits and drug-related problems mentioned or observed during the first consultation are also listed in Table 2.

Tailored intervention clustered in programmes

Table 3 shows the six pharmaceutical care modules provided to 199 patients and clustered in programmes.

Initially nearly all patients (n=186) demonstrated their inhaler technique to their pharmacist following module I: 106 patients (53%) had a sufficient inhaler technique, presented in Table 2. In the other cases, pharmacists had to improve the technique or could advise an appropriate device.

In 196 cases, the use of the drugs was discussed following module II: adherence to the prescribed treatment was problematic for 82 patients (41%) (Table 2).

With module III the patient's knowledge about the prescribed medication was tested. If necessary, information was supplied to improve the knowledge. In 83 cases (42%), the knowledge concerning the treatment (i.e. the use of corticosteroids) was insufficient (Table 2).

Because the pharmacists succeeded in informing and educating almost every patient utilizing all three modules, we call this trio the 'basic programme' of the IPMP intervention.

In programme 'device change' three possibilities are mentioned in Table 3: the pharmacist was able to change the device himself because of local agreements with physicians, the pharmacist advised the

physician concerning a new device, or the patient asked his physician for this device change during the next visit. Pharmacists suggested changing the device of 13 patients. Device change succeeded in 92%.

In the same way, programme 'drug change' was provided to 73 patients (Table 3) by the pharmacist. Usually corticosteroids were advised in the case of suspected asthma patients, or long-acting beta-2 agonists instead of high daily doses of short-acting beta-2 agonists. Eight patients were content with their original treatment and did not want to alter it. After the suggestion of the pharmacists, physicians considered the proposal. Most patients were invited by the physician to discuss this change. Finally, physicians and patients agreed to a drug change in 51 cases (77%).

In programme 'device and drug change' (Table 3) pharmacists were completely successful in 42 out of 51 proposals (87%). Five proposals were partly agreed upon (i.e. 4 times only a device change and 1 time a drug change).

Pharmacists' suggestions for medication change

On viewing the last two programmes and looking at them from another perspective, pharmacists suggested a change in the prescribed medication of 124 patients. The change was realized in 94 cases (76%), of which the pharmacists informed the physician 69 times and in 20 cases the patients informed the physician (Table 3). In five cases, a contact with the physician was not necessary because of local agreements.

In 30 cases, the suggested modification was not granted. Of these the pharmacist informed the physician 16 times, while the patient did this 5 times. Initially, nine patients did not want to alter their medication.

In Table 4 the different medication suggestions are shown. Overall the suggestion concerning inhalation corticosteroids was accepted 43 times, which is 46% of

Table 3 Individualized intervention clustered in programmes

Individualized intervention clustered in programmes Programme	Module ^a						Results		
	I	II	III	IV	V	VI	Successful	Unsuccessful	In all
Basic Intervention	+	+	+				62	–	62
Device change	+	+	+	+			12	1	13
Suggestion to patient	+	+	+	+			6	–	6
Proposal to physician by pharmacist	+	+	+	+			6	–	6
Proposal to physician by patient	+	+	+	+			–	1	1
Drug change	+	+	+		+		51	22	73
Suggestion to patient	+	+	+		+		3	7	10
Proposal to physician by pharmacist	+	+	+		+		36	11	47
Proposal to physician by pharmacist, patient disagreed	+	+	+		+		–	1	1
Proposal to physician by patient	+	+	+		+		12	3	15
Device and drug change	+	+	+	+	+		42 (+5) ^b	4	51
Suggestion to patient	+	+	+	+	+		2	2	4
Proposal to physician by pharmacist	+	+	+	+	+		32	1	33
Proposal to physician by patient	+	+	+	+	+		8	1	9
Partly successful: device change ^c	+	+	+	+	+		4	(4)	4
Partly successful: drug change ^d	+	+	+	+	+		1	–	1
In all	186	196	191	64	124		172	27	199
<i>Additional: Self-management</i>						52	51	1	52
Suggestion to patient						+	41	–	41
Proposal to physician by pharmacist						+	9	1	10
Proposal to physician by patient						+	1	–	1

^aFor description and contents pharmaceutical care modules see Method.

^b5 times partly successful.

^c3 times proposed by pharmacist to physician and 1 time by patient.

^dProposed by pharmacist.

all successful changes, and it was rejected 9 times, which is 30% of all disagreement. The suggestion to add a long-acting beta-2 agonist was rejected 19 times.

Self-management

Usually the pharmacist talked about self-management only if it was familiar to the patient. Otherwise he asked the GP for agreement. Self-management was installed in addition to one of all other scenarios and was offered 52 times (26%).

Follow-up

At the follow-up, patients mostly agreed with the treatment or device change and said they were more satisfied with their medication. Possible problems could be noticed and the intervention was continued till the individual aim of the intervention was achieved.

In 30 cases (15%) it was necessary to start a new episode after completion of the initial intervention. The composition and the average time spent on an intervention could be analysed and are shown in Table 5.

Satisfaction survey

Of the participating pharmacists, 24 out of 27 completed a questionnaire about their experiences with this type of pro-active pharmaceutical care. The results are shown in Table 6.

Before the start of the study 14 pharmacists were worried about the consultations, wondering whether

they were competent or educated enough to counsel their patients. All participants were usually satisfied during the study. They especially liked being able to educate the patients with their comprehensive pharmaceutical knowledge. They thought this kind of patient care to be an important part of their daily practice. Pharmacists contacted physicians in 100 cases (Table 5) during the study to make a proposal to improve the drug use. Most of these contacts were valued positively, only a few were frustrating.

Discussion

In this article we describe the interventions Dutch community pharmacists provided to patients at risk of sub-optimal drug therapy. The pharmacists reported success in improving drug use and drug treatment of these patients by a modular approach of pharmaceutical care. The IPMP intervention strategy can be considered as a complex intervention²⁶. To know how a complex intervention is effective the 'active ingredients' have to be described, monitored and evaluated in great detail. This article and this discussion especially deal with the interventions themselves.

The structured consultation tailored to patients' medication profiles enabled pharmacists to detect drug-related problems and the patients' perceptions of effectiveness of the therapy.

By analysing the documentation of provided pharmaceutical care modules and the achieved aims reported by the pharmacists, we could conclude

Table 4 Identification of what kinds of drugs are suggested for a dosage change or to add to the treatment

Pharmacological classification	Successful result	I*	II*	Unsuccessful result	I*	II*
Short-acting beta-2 agonists	4			2		
Anti-cholinergics	2					
Corticosteroids by inhalation	29	*		6	*	
Higher dose of corticosteroids	5	*		2	*	
Corticosteroids and long-acting beta-2 agonists	4	*	*	1	*	*
Higher dose of corticosteroids and long-acting beta-2 agonists	2	*	*			
Long-acting beta-2 agonists	27		*	16		*
Fixed combination of corticosteroids and long-acting beta-2 agonists ^a	18			1		
Corticosteroids agreed upon and long-acting beta-2 agonists not agreed upon	2	*		(2)		(*)
Other suggested combinations	1	*		2		
In all suggested: 124 times	94	43 (46%)	33 (35%)	30 (32)	9 (30%)	19 (59%)

I* concerning corticosteroids.
 II* concerning long-acting beta-2 agonists.
^a R03AK 06, 07.

that the intervention strategy was well implemented. Selections on the basis of patients' medication records as made by the validated IPMP computer instrument were used to initiate pro-active pharmaceutical care. Pharmacists reported satisfaction with the pharmaceutical care approach. Patients' opinions are described in a separate article²⁷.

Detected drug-related problems included lack of knowledge about medication and insufficient skills to handle an inhaler. Participating pharmacists observed improved adherence to prescribed medication after the intervention. In the IPMP study it is assumed that drug therapy according to evidence-based pulmonary guidelines^{2,3} lead to a better efficacy and better disease control. To almost all patients, the three pharmaceutical care modules clustered in the 'basic programme' were provided. Only when a new inhaler had to be prescribed due to the unavailability of patient's device any more or in case a patient did not appear to be an asthma or COPD patient, there was less reason for administering all three modules.

For some patients it was necessary to change a device to realize a proper inhaler technique. The high incidence of suggested device change (32%) also occurred because specific medicines (Ventolin Rotacaps®, Becotide Rotacaps® and Salbutamol Turbuhaler®) were withdrawn from the market during the study period.

In addition to the 'basic programme', suggestions to change medication were required. It was striking that agreement was achieved less often upon adding a long-acting beta-2 agonist than upon adding or optimizing anti-inflammatory medication (Table 4). This result could indicate that physicians hold on to former guidelines instead of following the new ones⁴.

No differences in success rate could be seen when either pharmacists or patients contacted the physician about a drug change, indicating that patients were very well capable of discussing their treatment with their physician. The overall success rate indicated that Dutch physicians were open to discussions about medication.

For 51 patients a simultaneous change of the device and medication was advised. This programme was even more successful than a medication change only. The withdrawal of both the mentioned devices from the market probably facilitated the agreement about drug change.

The high number of suggested medication changes might be related to the fact that the majority of the patients did not consult their physician on a regular basis.

The detected insufficient knowledge of pulmonary patients about medication and disease control as well as their concerns about their drug use was in accordance with a recent Dutch report¹. Education can improve patients' adherence to their medication^{31,32}. The selection and inclusion of patients based on drug use that deviated from guidelines was different from the inclusion of patients in other studies⁸⁻¹⁹. The professional review of drug use profiles made a pro-active and tailored intervention strategy possible.

A recent study of Weinberger et al. showed that pharmaceutical care programmes which were not well implemented do not result in 'maximum effectiveness'¹⁸. An important part of the IPMP study was assigned to education and development of the participating pharmacists and to the implementation of the pharmaceutical care modules. As a result, the pharmacists were well prepared for discussing pulmonary diseases and their treatment with patients and physicians in a professional manner.³³ Pharma-

Table 5 *The characteristics of the IPMP intervention*

<i>Extent of the intervention</i>	<i>Definition</i>	<i>Number or time</i>
Episodes of the intervention	First consultation	199
	Second episode	30
	Third episode	6
	Final consultation	138
Pharmacists' contacts during the IPMP intervention	Patients: visits in pharmacy	328
	Patients: home visits	11
	Patients: telephone calls	438
	Health care professionals	100
Average time consumption per patient	First consultation	49.5 min (SD 17.6 min.)
	Complete intervention	99.9 min (SD 29.9 min.)

Table 6 *Questions in the pharmacists' satisfaction survey (n=24)*

<i>Questions about the consultations and the complete intervention</i>	<i>Measure</i>	<i>Pharmacists</i>	
		<i>Number</i>	<i>%</i>
1 Were you worried to start the enhanced interventions to patients in connection with the IPMP study?	Yes	1	4
	Yes, a little	13	54
	No	10	42
2 Did you give the answer 'yes' to question 1 because you were afraid to have...?*	A lack of knowledge about pulmonary diseases	2	8
	Too little experience in counselling patients	4	16
	Domain problems with physicians	7	29
	Shortage of time	3	12
	Other given answers	3	12
3 Were you satisfied about the consultations afterwards?	Yes, always	12	50
	Yes, usually	11	46
	Sometimes	1	4
	No, never	0	0
4 Could you use your comprehensive pharmaceutical knowledge in the consultations?	Yes, always	11	46
	Yes, usually	13	54
	Sometimes	0	0
	No, never	0	0
5 What was your opinion about the consultations?*	Inspiring	12	50
	Pleasant	22	92
	Instructive	13	54
	Nothing special, it is daily practice	4	16
6 Do you think these consultations should be daily practice?	Yes	22	92
	More or less	2	8
	No	0	0
7 Were the complete interventions worthwhile compared with the required time consumption?	Yes	4	16
	It took up much time but 'it has to be done'	16	67
	No, it took up too much time	4	16
8 How did you experience the contacts with patients' physicians?*	Positively	20	83
	Professionally	4	16
	Frustrating	2	8
	No reaction at all by the physician	3	12

*Pharmacists could give several answers.

cists' adherence to the IPMP protocols might be the determinant for the positive results. The time spent on patient consultations was comparable with other studies^{17,19,34}.

Limitations

A limitation of this part of the IPMP study is that results were almost completely based on self-reports of pharmacists and patients and are therefore sensitive to

socially desirable answers. To show firm evidence and sustainability of the effects of the intervention, the IPMP study was framed as a randomized controlled trial, of which the evidence after a 1-year period will be described in another article.

A second limitation is the fact that the diagnosis was not mentioned on the prescription, though the pharmacists were able to establish the fact that the patients had a specific pulmonary disease. In addition, when

pharmacists found a reason to change the medication, they always consulted the patient's physician in order to be informed correctly about the diagnosis³³.

A third limitation is that 199 patients (44% of the invited patients) gave informed consent resulting in more women and elderly in the study population compared to all persons selected in the intervention arm. The inability of the pharmacists to reach all patients was considered as the most important reason for the low response to their invitation but it was seen in other studies also in even lower proportions¹⁸.

Conclusion

In the IPMP study, pharmacists observed a better drug use after educating patients selected by the IPMP computer instrument or by solving their drug-related problems. In collaboration with physicians drug treatment could be improved.

Pharmacists were well-instructed and all activities were monitored extensively. Under these conditions interventions were visible and could be described in great detail.

Conflicts of interest

None.

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References

- 1 Anonymous. Monitor zorg- en leefsituatie van mensen met astma en mensen met COPD (Monitor of care and living condition of asthma and COPD patients). Utrecht, The Netherlands: Nivel, 2003. ISBN 90-6905-615-1.
- 2 Anonymous. Global strategy for asthma management and prevention. NHLBI/WHO report. Bethesda, Maryland: National Institutes of Health, 1995.
- 3 Pauwels RA, Buist AS, Calverly PMA et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease. *Am J Respir Crit Care Med* 2001; 163(5): 1256–76.
- 4 Geijer RMM, Van Hensbergen W, Bottema BJAM, Van Schayck CP, Sachs APE, Smeele IJM et al. NHG-Standaard Astma bij volwassenen: Behandeling (NHG Asthma standard for adults: treatment). *Huisarts Wet* 2001; 44: 153–64.
- 5 Geijer RMM, Van Schayck CP, Van Weel C, Sachs APE, Bottema BJAM, Smeele IJM et al. NHG-standaard COPD: behandeling (NHG COPD standard: treatment). *Huisarts Wet* 2001; 44(5): 207–19.
- 6 Rabe KF, Vermeire PA, Soriano JB, Maier WC. Clinical management of asthma in 1999: the Asthma Insights and Reality in Europe (AIRE) study. *Eur Respir J* 2000; 16: 802–7.
- 7 Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. *Am J Hosp Pharm* 1990; 47: 533–43.
- 8 Narhi U, Airaksinen M, Tanskanen P, Enlund H. The effects of a pharmacy-based intervention on the knowledge and attitudes of asthma patients. *Patient Educ Couns* 2001; 43: 171–7.
- 9 De Tullio PL, Corson ME. Effect of pharmacist counselling on ambulatory patients' use of aerosolized bronchodilators. *Am J Hosp Pharm* 1987; 44: 1802–6.
- 10 Diamond SA, Chapman KR. The impact of a nationally coordinated pharmacy-based asthma education intervention. *Can Respir J* 2001; 8: 261–5.
- 11 Van Mil JWF, Vander Graaf CJ, Tromp TFJ. Een keer is niet genoeg. De inhalatie-instructie (Once is not enough. The inhaler instruction). *Pharm Weekbl* 1995; 130: 1103–11.
- 12 Solomon DK, Portner TS, Bass GE, Gourley DR, Gourley GA, Holt JM et al. Part 2. Clinical and economic outcomes in the hypertension and COPD Arms of a multicenter outcomes study. *J Am Pharm Assoc* 1998; 38: 574–85.
- 13 Herborg H, Soendergaard B, Froekjaer B, Fønnesbaek L, Jørgensen T, Hepler CD et al. Improving drug therapy for patients with asthma – part 1: patient outcomes. *J Am Pharm Assoc* 2001; 41: 539–50.
- 14 Herborg H, Soendergaard B, Jørgensen T, Fønnesbaek L, Hepler CD, Holst H et al. Improving drug therapy for patients with asthma – part 2: Use of antiasthma medications. *J Am Pharm Assoc* 2001; 41: 551–9.
- 15 Van Mil JWF. Pharmaceutical Care: the Future of Pharmacy, Theory, Research and Practice [Dissertation]. Zuidlaren, The Netherlands: J.W.F. van Mil; 1999. ISBN 90-9013367-4.
- 16 Schulz M, Verheyen F, Muehlig S, Mueller JM, Muehlbauer K, Knop-Schneickert E et al. Pharmaceutical care services for asthma patients: a controlled intervention study. *J Clin Pharmacol* 2001; 41: 668–76.
- 17 Narhi U, Airaksinen M, Enlund H. Pharmacists solving problems in asthma management – experiences from a one-year intervention programme in Finland. *Int J Pharm Pract* 2002; 10: 55–9.
- 18 Weinberger M, Murray MD, Marrero DG, Brewer N, Lykens M, Harris LE et al. Effectiveness of pharmacist care for patients with reactive airways disease, a randomized controlled trial. *JAMA* 2002; 288: 1594–602.
- 19 McLean W, Gillis J, Waller R. The BC community pharmacy asthma study. *Can Respir J* 2003; 10: 195–202.
- 20 Monster TBM, Janssen WMT, De Jong PE, DeJong-vanden Berg LTW. Pharmacy data in epidemiological studies: an easy to obtain and reliable tool. *Pharmacoepidemiol Drug Saf* 2002; 11: 379–84.
- 21 Lau HS, De Boer A, Beuning KS, Porsius A. Validation of pharmacy records in drug exposure assessment. *J Clin Epidemiol* 1997; 50: 619–25.
- 22 Essink RTGM, Vanden Hoff OP, Koper JF, De Smet PAGM. Wie wel, wie niet? CARA CHECK searches voor extra zorg (Selecting asthma/COPD patients. Searches for extra care). *Pharm Weekbl* 2001; 136: 594–9.
- 23 Van Akkerveeken HM, Kelder O, Stuijt CCM, Vander Wolf JW, Buurma H, Gerrits CMJM. Inhalatiesteroïden plus langwerkende beta-2 agonisten. Een gewenste combinatie (A desirable combination. Inhalation corticosteroids plus long-acting beta-2 sympathicomimetics). *Pharm Weekbl* 2000; 135: 911–4.
- 24 Geers H, Pot HM, Overmars-vander Weij WCK, Gerrits CMJM, Buurma H. De standaard en de praktijk. Gebruik van inhalatiesteroïden bij chronisch astma (Standard and practice. Use of inhaled corticosteroids in chronic asthma). *Pharm Weekbl* 2001; 136: 266–70.
- 25 Van Mil JWF, Dudokvan Heel MC, Boersma M, Tromp TFJ. Interventions and documentation for drug-related problems in Dutch community pharmacies. *Am J Health-Syst Pharm* 2001; 58: 1428–31.
- 26 Anonymous. A framework for development and evaluation of RCTs for complex interventions to improve health. <http://www.mrc.ac.uk> (last visited April 2005).
- 27 Stuurman-Bieze AGG, Kokenberg MEAP, Tobi H, De Boer WO, Van Doormaal JE, De Jong- van den Berg LTW et al. Complex pharmaceutical care intervention in pulmonary care. Part B: Patient opinion and process survey. *Pharm World Sci* 2005; 27: 385–92.
- 28 Stuurman-Bieze AGG, Vanden Berg PB, Tromp TFJ, DeJong-vanden Berg LTW. Computer-assisted medication review for asthmatic patients in community pharmacies as a basis for an intervention. *Pharm World Sci* 2004; 26(5): 289–96.
- 29 <http://www.qipc.nl> → onderzoek → IPMP (last visited April 2005).
- 30 Anonymous. NODE inhaler technique protocols. Kampen, The Netherlands: Quality Institute for Pharmaceutical Care, 2000.
- 31 Gallefos F, Bakke PS. How does patient education and self-management among asthmatics and patients with chronic obstructive pulmonary disease affect medication? *Am J Respir Crit Care Med* 1999; 160: 2000–5.
- 32 Cote J, Bowie DM, Robichaud P, Parent JG, Battisti L, Boulet LP. Evaluation of two different educational interventions for adult patients consulting with an acute asthma exacerbation. *Am J Respir Crit Care Med* 2001; 163: 1415–9.
- 33 Stuurman-Bieze AGG, Booij AD, De Boer WO, Sonderen C, Tromp TFJ. Techniek en training leiden tot het doel. Hordelopen bij pro-actieve farmaceutische patiëntenzorg [Skills and training lead to the finish]. *Pharm Weekbl* 2003; 138: 1129–34.
- 34 Knoell DL, Pierson JF, Marsh CB, Allen JN, Pathak DS. Measurement of outcomes in adults receiving pharmaceutical care in a comprehensive asthma outpatient clinic. *Pharmacotherapy* 1998; 18: 1365–75.