Chapter 10

Patient Compliance in the Treatment of Pulmonary Disease Based on Prescription Data from Pharmacies


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Abstract

In the therapy for pulmonary disease, the use of inhaled corticosteroids is usually intended for long-term maintenance treatment. Patient compliance, defined as the extent to which the patients’ medication taking corresponds to the prescribed drug regimens, is a major issue, and is generally insufficient. In a retrospective study, patient compliance to inhaled corticosteroids has been investigated using prescription data from 13 pharmacies. Assessment of patient compliance was possible for approximately one-third of the data. Patients have been classified compliant if the medication use is between a lower level of 85% and an upper level of 130% of the prescribed regimen. The largest group of patients (47.6%) is likely to have a compliance lower than 85% and thus underuse their medication. Only a limited number of patients (7.7%) overuse their medication. Finally, 44.7% of these patients are found to be compliant to the prescribed dosage regimen of inhaled corticosteroids. Patient compliance depends on age of the patient and the type of inhalation device used. Patient compliance increases with increasing age. Insufficient patient compliance is a point of interest for many health care providers.
Since the introduction of the concept of Pharmaceutical Care, in the beginning of the 1990s, an increasing number of projects has been initiated to optimise individual patient care. Pharmaceutical Care is an integrated philosophy of health care practice to combine the expertise of pharmacists with influencing prescribing and evaluating drug regimens on one side and counselling on the other side to improve patients’ quality of life\(^1\).\(^2\). This philosophy of Pharmaceutical Care has been reformulated a few years later to a more useful practical description for pharmacy practice. Pharmaceutical Care has since been defined as “A practice in which the practitioner takes responsibility for a patients’ drug related needs, and is held accountable for this commitment\(^3\)”. Starting from this concept, the pharmacists peer review group NODE (Noord-Oostpolder / IJssel-Vecht Delta, the Netherlands) initiated several projects on different topics. In 1998, the asthma and COPD project was initiated. Compliance to prescribed drug regimens and an improved inhalation technique are likely to improve therapeutic efficacy in patients with pulmonary disease. In this project intervention by pharmacists on a patient level was used to obtain this improvement. The intervention was based upon patient education and counselling concerning the necessity to use inhaled corticosteroids and by providing structured inhalation-instructions in the pharmacy. This chapter will focus only on the patient compliance assessment. In 13 pharmacies, the electronic prescription databases were used for the selection of patients with pulmonary diseases. Selection criteria were based on the Anatomical Therapeutic Chemical (ATC) Classification Index codes R03BA, which are the inhaled corticosteroids. For all selected patients, medication records were analysed and patient compliance was calculated.
10.1.2 Patient compliance

The term patient compliance in a medical context is generally defined as the extent to which the patients’ medication taking history corresponds to the prescribed drug regimens and thereby following the instructions of the health care provider\(^4-8\). Variable patient compliance is recognised as a potential complication in patient care\(^5, 9\). The compliance of patients with a chronic disease, including respiratory diseases, is often inadequate. In an international study on asthma treatment compliance\(^10\) it was shown that the median compliance in asthma medication is 68%. Compared to this, the median compliance of 74% in The Netherlands is relatively high\(^10\). Compliance with maintenance therapy, such as inhaled corticosteroids, which effect is noticeable only after a period of weeks, may be less than compliance with drugs that relieve asthma symptoms more rapidly\(^9\). Therefore, for inhaled corticosteroids, studies mainly focus on underuse of the medication compared with the prescribed dose.

Compliance includes two different aspects: dose-taking and dose-timing reflected by ‘taking compliance’ and ‘timing compliance’. Taking compliance is an indicator for the proportion of days in which the prescribed dose regimen was taken as prescribed. Timing compliance is the proportion of prescribed doses taken within a defined time window of the prescribed interval\(^11, 12\). By determining the taking compliance there is no information about the timing compliance. In a dosage regimen of twice daily, both dosages could be used at ones in stead of separately. The both types of compliance are divided in four classifications of medication use, as given in table 10.1.

<table>
<thead>
<tr>
<th>medication use</th>
<th>type of compliance</th>
<th>definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>appropriate use</td>
<td>dose taking</td>
<td>the patient takes the medication in a way that conforms satisfactorily to prescribed use</td>
</tr>
<tr>
<td>(compliant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>underuse</td>
<td>dose taking</td>
<td>the patient takes less medication than prescribed</td>
</tr>
<tr>
<td>overuse</td>
<td>dose taking</td>
<td>the patient takes more medication than prescribed</td>
</tr>
<tr>
<td>erratic use</td>
<td>dose timing</td>
<td>the patient both overuses and underuses the prescribed medication, by taking the medication at the wrong time</td>
</tr>
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</table>

Several methods of measuring compliance are reported in literature, patient diaries (self reported)\(^4, 13-15\), physician opinions\(^14\), measuring the amount of drug used (weighing inhalers or counting capsules or blisters)\(^14, 15\), biochemical measures with low-dose, slow-turnover chemical markers\(^11\), electronic medication event monitor\(^4\) or other electronic measuring devices like a Turbuhaler Inhalation Computer\(^16, 17\), Electronic Diskhaler\(^18\) or Nebulizer Chronolog\(^14, 18-20\). All these methods have their advantages and disadvantages and are sensitive to patients’ fraud. With all types of measurement methods an estimate for the taking-compliance can be made. Only with the electronic measuring devices an exact
measuring of taking- and timing-compliance can be made. Comparison of different methods showed that patient self-report, physician rating, and inhaler weighing all gave significantly higher estimates of patient compliance than the electronic methods\(^{(9)}\).

The setting of the current study was a retrospective measurement of the patient compliance. For this type of measurement the prescription data from the pharmacies are very useful\(^{(21)}\). Some pitfalls might occur, when using prescription data for the measurement of patient compliance. The information about the patients' drug consumption is the refill rate and the prescribed daily dosage. Therefore, taking compliance can only be estimated. When prescription data is used for the measurement of patient compliance, it is only possible to measure long-term patient compliance, because patients may have different amounts of drugs in stock at the time of refill. Moreover, one have to be aware of the fact that only the dispensing of drugs is measured, which does not give any information about the actual consumption of the drugs. Therefore, it is more correct to talk about dispensing compliance to the prescribed drug regimens. In this study the assumption is made that the patient uses the delivered doses and get its refill when the inhaler device is almost empty. Therefore, a range of 85% to 130% of the prescribed doses has been defined in which the patient is classified as compliant. Classification of the patients will be discussed in more detail in the method section.

In the Dutch situation, the medical practice is organised to link prescription to follow-up visits to the physician. The patient to whom a chronic-use medicine has been prescribed, usually receives a repeat prescription, at each visit. Usually, the physician assistant gives out the repeat prescription, and therefore, the physician does not necessarily see the patient. The prescribed quantity of medicines is a sufficient supply, assuming full compliance, to reach the next-scheduled visit, with a maximum supply for three months treatment. At the next visit, the patient will be given another prescription\(^{(9)}\). This type of prescribing may lead to a ‘white-coat compliance’, resulting in an overestimate of drug use compliance. By only measuring the drug dispensing, as done in this pharmacy practice setting, drug dumping and/or drug stocking are not discovered.

With the introduction of self-management programs for the treatment of asthma or COPD, false identification of underuse might occur. In a self-management program, patients are educated in an effective behaviour towards asthma, based on sufficient knowledge and the ability to measure the disease severity with a peak flow meter. This will result in a self-treatment dosage regimen of the inhaled medication by the patient with changing disease severity\(^{(18, 22, 23)}\). Despite of these education programs, it is known that patients hesitate to increase their use of inhaled corticosteroids as a response to decreased peak flow\(^{(13, 18)}\). As erratic use is related to timing compliance, and if erratic use does not result in omitted dosage, it will be undiscovered in our setting. Other biases in the compliance calculation are errors in the patient medication records. Incorrect registration of the prescribed daily dosage,
or changes in prescribed daily dosage, without notification in the patient medication records, results in wrong calculation of compliance. Early refill might also result in a calculation of overuse. However, the upper level of compliance at 130%, overcome this problem. In some cases, overuse is the result of replacement of a lost inhaler device, or by the dispensing of another inhaler for the use in the car, at work, at the boat or at the campsite. This problem might occur especially for devices with large amounts of dosages, as the p-MDI, Turbuhaler and Diskus.

Patient compliance depends on different parameters, especially parameters directly related to patients’ behaviour. Health care providers might influence this behaviour by appropriate prescribing, patient education and counselling. The prescribing behaviour of the general practitioner is directly related to the choice of the inhaler device and the prescribed doses to be taken every day (chapter 8). An appropriate inhalation technique will significantly effect the inhalation behaviour of the patient, but may also depend on the age of the patient and patients’ awareness and beliefs\(^{(24)}\) on the need of a proper inhalation technique. The pharmacist may have influence on the patient compliance due to patient education and counselling.

## 10.2 Method

### 10.2.1 Study design

Prescription data from 13 pharmacies in the pharmacists peer review group NODE, The Netherlands, were used in this retrospective study. From the computerised patient medication records a selection of all patients with prescribed inhaled corticosteroids was made, based on the ATC code R03BA (R03BA01 = Beclometasone, R03BA02 = Budesonide, and R03BA03 = Fluticasone). For all selected patients the relevant information about the use of inhaled corticosteroids over the years 1996/1997, 1997/1998, 1998/1999 and 1999/2000 were collected anonymously in a database, which was centrally maintained. In every year the drug consumption from 1 October up to 31 March was used to calculate the compliance rate.

### 10.2.2 Data collection

In Dutch community pharmacies, each prescription is registered in detail on a patient level in the pharmacy computer system and majority of patients obtain their prescription drugs from one pharmacy\(^{(25)}\). The window in which compliance was calculated was defined between 1 October up to 31 March. For each year this window was used to exclude bias due to seasonal related drug use. For an appropriate analysis of start date and end date of the drug use, which is outside the defined window, the patient medication records from July till June next year were collected.
A database was developed in which all relevant data were collected. For privacy reasons the patient identification parameters were coded. The database consists of a patient number, gender, age, pharmacy code and a general practitioner code, as identification. Medication use was registered by several different parameters. Firstly, the type of inhaler device was selected. In the Netherlands, eight different inhalers are available for the inhalation of corticosteroids, p-MDI, Autohaler, Cyclohaler (ISF inhaler), Rotahaler, Diskhaler, Diskus, Turbuhaler, and Nebulizer. Deviations between p-MDI and Autohaler were often difficult to recognise from the patient medication registration. Therefore, p-MDI and Autohaler data were merged and analysed as one type of inhaler. Only a limited number of patients used a Nebulizer. Therefore, this group was rejected for further analyses. Secondly, the type of inhaled corticosteroid was selected, Beclometasone, Budesonide, or Fluticasone. Thirdly, starting point and end point for the compliance measurement was determined. Starting point for the compliance measurement was the last date of the prescription refill before 1 October (figure 10.1 (start date is 1)). End point was the first date of prescription refill after 31 March (figure 10.1 (end date is 4)). Fourthly, the number of doses dispensed between start point and end point and the number of contact moments were determined. Fifthly, the number of prescribed daily doses was determined. Finally, depending on the drug user profile during the measurement window, the patient was classified in one of the following categories:

1. **Assessment of compliance**: data of patients without changes in therapy were used for calculation of compliance.

2. **Has therapy started**: the first dispense of an inhaler was after 1 October and therapy was continued, also after 31 March (figure 10.1 (start date is 2 or 3)).

3. **Has therapy stopped**: the start date of inhaler use was before 1 October and the end data was in the period between 1 October and 31 March (figure 10.1 (start date is 1, end date is 2 or 3)).

4. **Episodic uses**: the start date and end date was between 1 October and 31 March (figure 10.1 (start date is 2, end date is 3)).
5. Has changed device: the patient changed device in the period between 1 October and 31 March. Categories, ‘therapy started’, ‘therapy stopped’ or ‘episodic user’ overrule ‘changed device’.


After all, re-entering and comparing of a representative random data sample was done to validate the database. Error limit was defined at 3%, however only an error level of less than 1% was found. Unrealistic values were found by visual check of the data and corrected if possible.

10.2.3 Patient Compliance

The first inclusion criterion for the calculation of compliance is a ranking in the category ‘assessment of compliance’. Calculation of compliance is only possible if the total number of dispensed doses and the prescribed daily dose during the measurement period are known. The patient compliance was calculated according to equation 10.1.

\[
Compliance = \frac{\text{Sum of dispensed doses over interval}}{\text{Doses to be taken per day} \times \text{Number of days between first and last fill}} \times 100\%
\]

*Equation 10.1: Calculation of patient compliance.*

A perfectly compliant patient has a compliance rate of 100%. In this study the patient was considered to be compliant if the compliance rate was between a lower limit of 85% and an upper limit of 130%. Compliance below 85% was defined as underuse, while compliance above 130% was defined as overuse. Due to the used method for compliance calculation it is not possible to observe erratic drug use. The compliance limits of 85% and 130% are based on a consensus meeting (OPTICOR) with various professionals (chest physicians, general practitioners, (hospital) pharmacists, internist, insurance company, and an inhalation researcher). The professionals examined compliance rates of a representative sample and gave their opinion about the drug use. The compliance limits are in line with reported levels from literature[9, 12, 13, 18].

Patient compliance depends on different parameters. The influence of several variables on patient compliance has been investigated in this study. These variables were the age of the patient, inhaler device, general practitioner, pharmacist and pharmacotherapy-counselling group, the so-called FTO, of the pharmacist.
10.3 Results

10.3.1 Study population

Prescription data, from 13 pharmacies, selected on ATC code R03BA was collected in a centrally maintained database. Patients of 17 years and older, with a defined drug use have been included in the database. For privacy reasons the patient identification parameters were coded. Demographic characteristics and classification of patients in each category is given in table 10.2. Only for those patients mentioned in the category ‘assessment of compliance’ a compliance rate was calculated, and these patients data were used for further analysis.

Table 10.2: Demographic characteristics of patients in the NODE compliance database.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Patients in database (≥17 yr.)</td>
<td>2837</td>
<td>3034</td>
<td>3153</td>
<td>3375</td>
</tr>
<tr>
<td>Mean age (±S.D) (yr.)</td>
<td>56.0 (±19.1)</td>
<td>55.9 (±19.2)</td>
<td>54.8 (±18.9)</td>
<td>55.5 (±19.1)</td>
</tr>
<tr>
<td>Gender (female / male)</td>
<td>1393 / 1444</td>
<td>1505 / 1529</td>
<td>1614 / 1539</td>
<td>1719 / 1656</td>
</tr>
<tr>
<td>Assessment of compliance</td>
<td>945 (33.3%)</td>
<td>1045 (34.4%)</td>
<td>1156 (36.7%)</td>
<td>1216 (36.0%)</td>
</tr>
<tr>
<td>Therapy started</td>
<td>533 (18.8%)</td>
<td>525 (17.3%)</td>
<td>481 (15.3%)</td>
<td>573 (17.0%)</td>
</tr>
<tr>
<td>Therapy stopped</td>
<td>289 (10.2%)</td>
<td>337 (11.1%)</td>
<td>406 (12.9%)</td>
<td>457 (13.5%)</td>
</tr>
<tr>
<td>Episodic user</td>
<td>645 (22.7%)</td>
<td>782 (25.8%)</td>
<td>888 (28.2%)</td>
<td>959 (28.4%)</td>
</tr>
<tr>
<td>Changed device</td>
<td>233 (8.2%)</td>
<td>146 (4.8%)</td>
<td>126 (4.0%)</td>
<td>96 (2.8%)</td>
</tr>
<tr>
<td>Changed dosage regime</td>
<td>192 (6.8%)</td>
<td>199 (6.6%)</td>
<td>96 (3.0%)</td>
<td>74 (2.2%)</td>
</tr>
</tbody>
</table>

10.3.2 Patient classification

Approximately one-third of the patient population in the NODE database was categorised for assessment of compliance, and was used for the calculation of patient compliance. The other part of the patients were categorised in one of the other categories: ‘therapy started’, ‘therapy stopped’, ‘episodic user’, ‘changed device’, or ‘changed dosage regime’ (table 10.2). The relative number of patients in each classification, stratified by age, are given for each measurement period (figure 10.2). With increasing age, the relative number of patients in assessment of compliance group increases statistically significant (p<0.001) (figure 10.2). The relative number of patients in the categories ‘therapy started’, and ‘therapy stopped’ are almost equal in all age categories. The category ‘changed dosage regime’ increases slightly with increasing age. On the other hand, a statistical significant (p<0.001) decrease is found for the category ‘episodic user’ with increasing age. The variation in the category ‘changed device’ is not related to age.
10.3.3 Patient Compliance

The mean (±S.D.) patient compliance to the prescribed dosage regimen is 86.4% (±40.0), 88.2% (±39.4%), 84.0% (±39.2%), and 82.2% (±40.5), for the measurement periods 1996-1997, 1997-1998, 1998-1999 and 1999-2000, respectively. The percentages of patients in the categories underuse, compliant and overuse are given in figure 10.3.

The relationship between age and patient compliance is given in the figures 10.4 and 10.5. Figure 10.4 also gives a description of the relative number of patients for assessment of compliance, in each age category. The relative distribution on national use of inhaled corticosteroids (ATC-code R03BA) in 1999(26), as well as the inhaled corticosteroid use in the total NODE database, related to age is also given in figure 10.4. From figure 10.4 it seems that the overuse is increasing by increasing age. However, comparing the different age categories on a relative scale (figure 10.5), an increase in overuse is not noticeable above an age of 30 years. On the other hand, a decrease in underuse and an increase in the group compliant are noticed. No gender related differences in patient compliance were found.

Deviation of compliance by the used inhaler device is shown in figure 10.6. During the first year of the measurement of compliance, the Diskus inhaler device was not yet available on the Dutch marked. The introduction of the Diskus on the market gave an interference with the
measurements of compliance in the first year. Therefore, agreements were made in the pharmacy peer review group to dispense the Diskus on a reluctant base. Chest physicians and general practitioners in the region were informed about this agreement. Despite of this agreement the Diskus is prescribed a number of times as shown in figure 10.6.

![Figure 10.3: Overall patient compliance for the use of inhaled corticosteroids. Indicated is the percentage of patients in the categories underuse, compliant and overuse for each year.](image)

Several variables may influence patient compliance. From the variables used in this study, there were no relevant influences found on patient compliance related to the different pharmacotherapy-counselling groups. Patient compliance is mainly related to the age of the patient and the type of inhaler device. Results of this multivariate relation on the patient compliance are plotted in a mosaic plot\(^{27}\) (figure 10.7). In a mosaic plot for age of patient, inhaler device, and patient compliance, widths in the rectangles are proportional to the frequency in age of the patient. Heights are proportional to the frequency in inhaler device. Each rectangle is subdivided horizontally to show the proportions of people at each compliance level. The area of each cell is proportional to the number of patients in the database.

### 10.4 Discussion

Inhalation devices are the most prescribed medication delivery systems for the treatment of asthma and COPD. However, many patients do not benefit from inhaled medication because they do not properly use their medication. As with any chronic disease, patient compliance is an important determinant of therapeutic success. For the determination of patient compliance
Figure 10.4: Patients in the categories underuse, compliant and overuse stratified by age and measurement period as percentage of total patients in assessment of compliance. Indicated are the relative national use (●) of inhaled corticosteroids (R03BA) in 1999, and the relative total number of patients in the NODE database (▲), stratified by age for 1998-1999.

Figure 10.5: Relative number of patients in the compliance categories underuse, compliant, and overuse for each age category and measurement period.
Figure 10.6: Percentage of patients in the categories underuse, compliant and overuse, stratified by inhaler device and measurement period. Inhaler devices are ordered by level of overall presence in the compliance measurements. Diskus was not available (NA) on the Dutch market in the period 1996-1997.

with inhaled corticosteroids (ATC-code R03BA), a database was constructed based on prescription data from 13 pharmacies. Medication use was categorised in one out of six categories. For the categories, ‘therapy started’, therapy stopped’, and ‘changed device’, no relationship with the age of the patient could be detected. The category ‘changed dosageregime’ is small, but slightly increases with age of the patient. On the other hand, the category ‘episodic user’ substantially decreases with increasing age (figure 10.2). Episodic use is usually related to seasonal allergy. The measurement period for this study was already chosen outside the pollen periods, but also in winter period seasonal asthma might occur. For younger patients, the prevalence of pulmonary disease with asthma related component is higher compared to older patients\(^\text{(23)}\). Therefore, episodic treatment with inhaled corticosteroids is higher for the younger patients (figure 10.2).

Patient compliance was calculated for those patients categorised in category assessment of compliance. The number of patients in this category increases with increasing age (figure 10.4). In figure 10.4 is demonstrated that the relative number of patients in the category assessment of compliance is representative for the relative national use of inhaled corticosteroids (R03BA) in The Netherlands, and the relative total number of patients in the NODE database. From the population of the NODE database, it is shown that 44.7% of the patients in the assessment of compliance group are compliant to the prescribed medication.
On the other hand, 55.3% of the patients in the assessment of compliance group are not taking their medicines appropriately and, therefore, may not receive the intended benefits of the treatment. The results indicate that patients are more likely to underuse than overuse inhaled corticosteroids\textsuperscript{(13, 18)}.

The results in figure 10.4 suggest an increase in overuse with increasing age. However, when the relative number of patients in the compliance categories is presented for each age category and measurement period this is shown not to be the case (figure 10.5). The percentage of patients with overuse is almost unchanged for the age categories above 30 years. The relative percentage of patients with appropriate use is increased, while the relative percentage of patients with underuse is decreased with increasing age. Several psychological reasons, as patient beliefs about their illness and treatment, might be involved in this\textsuperscript{(6, 24, 28)}.

Nature of asthma might be an important determinant for patient compliance in the younger patients. When a patient has not experienced an attack for an extended period of time, he might reduce the number of inhalations or stop the use of inhaled corticosteroids, resulting in underuse of the medication. Also, the delayed clinical impact of inhaled corticosteroids compared with bronchodilator drugs may be an additional factor in non-compliance.

With increasing age, patients are more compliant to the prescribed drug regimens. In older patients, polypharmacy regularly occurs\textsuperscript{(25)}. One of the reasons for older patients to control their diseases better could be the fear of having to move to a rehabilitation centre or to a nursing home\textsuperscript{(7)}. Patients living situations and a consistent, daily routine for taking medication built into daily activities is preferable for patient compliance. In this, the frequency of inhalations in the dosage regimen is also an important determinant for compliance, and actually related to the daily routine for taking medication. In general, daily routine is higher with increasing age\textsuperscript{(7)}.

Education will increase compliance with dosing regimens, as shown by Van der Palen et al.\textsuperscript{(18)} in which patients are extensively educated for a self-management programme. However, the variable use of inhaled corticosteroids by patients in a self-management programme result in a systematic measurement of underuse of the prescribed dosage regime\textsuperscript{(18)}.

As shown in figure 10.6 the number of patients with a prescribed dry powder inhaler is more than four times the number of prescribed p-MDI’s. In this population, the Diskhaler is the most prescribed dry powder inhaler. There are only minor differences in underuse or appropriate use between the different inhaler devices, except for the Diskus, in which underuse was prevalent in more than 60% of the users. Overuse occurs in about 5% of the patients using a particular inhaler. However, for the users of a Turbuhaler or a p-MDI overuse occurs in about 15% of the patients. Both types of inhalers are multiple-dose inhalers with usually 200 dosages. For both types of inhalers it is also not perfectly clear whether they are empty or not. In case of a Turbuhaler, when refill might occur as soon as the red marker
appears to indicate the last 20 doses, this result in an overuse of approximately 10%, which is far below the upper limit for compliance of 130%. On the other hand, the p-MDI does not have any dose counter at all. Many patients use test sprays to control the functionality of the p-MDI, which results in drug dumping. Also the use of priming sprays in a spacer device results in drug dumping. Providing adequate inhalation-instructions can reduce this unnecessary drug use. Furthermore, dispense of an extra inhaler device in the measurement period, for replacement of a lost inhaler or for the use at another location, did result in an overestimate of drug use. In figure 10.7 it is demonstrated that the use of p-MDI's is increased with age (chapter 8). With increasing age also a worsening of disease might occur. Therefore, for reliably managing of the disease, an increase in dosing of inhaled corticosteroids might be necessary, which could be a reason for the measured overuse with the p-MDI.

In calculating the patient compliance the registered prescribed daily dose is an important factor. In those cases with an unclear prescription, like two or three times a day two or three inhalations, or use known to patient according to physicians’ oral instruction were excluded from assessment of compliance.

Multi-dimensional analysis of the influence of the different parameters on patient compliance implicates that the distribution of patients in the different categories of patient compliance depends on age of the patient and the used type of inhaler device. In the mosaic plot (figure 10.7), it is shown that the largest group of patients was between 71-80 years, using a Diskhaler. The largest group of these patients was compliant to the prescribed drug regimens. With increasing age, the number of patients using a p-MDI increases rapidly. This group also includes the patients using a spacer device or an Autohaler.

In this analysis no relevant differences were found in patient compliance related to the different, general practitioners, pharmacists and pharmacotherapy-counselling groups. The variables, general practitioner and pharmacist, are actually combined by the pharmacotherapy-counselling groups. This does not necessarily mean that there are no differences in individual patient care, but the individual influence on patient compliance was not detectable.

An early treatment with anti-inflammatory drugs, such as inhaled corticosteroids, is important in case of inflammatorily diseases like asthma and COPD. The efficacy of such therapy not only depends on adequate prescription, but also on a good patient compliance and a proper inhalation technique\(^{13, 29}\). Therefore, the number of patients with inappropriate use of their medication should be reduced. Increasing education and knowledge about the medication and dosage regimen is one of the opportunities. As shown in other studies, patient compliance highly depends on communication between the patient and the health care provider\(^{9, 30, 31}\). Because compliance is influenced by the patients’ satisfaction with care, the health care provider should treat the patient as an active participant in discussions about his condition and his treatment\(^{24, 30}\). Agreements between physicians and pharmacists should be used to create
a well working network in which patient education and counselling may help to improve the patients’ knowledge about the use and the dosage regimen of their inhaled medication, to improve patient compliance. Determining patient compliance based on prescription data can be a reliable tool for tracing patients who require additional care.

In the four years of measurement, the overall patient compliance on inhaled corticosteroids in the NODE database is 85%. This is high compared to the reported patient compliance on asthma medication of 74% in The Netherlands, as given an international survey study\(^{(10)}\). Generally spoken, agreements as made in a pharmacy peer review group, as NODE, should be extended to a higher level. Harmonisation of agreements between general practitioners, pharmacists and even the chest physicians (the so-called FTTO-groups in The Netherlands), in which each profession has its own responsibilities, may result in a good working network.
with patient care as major target. Agreements in the network make sure that the patient will receive adequate patient education and counselling, by providing inhalation-instruction and frequent checks on inhalation technique of the patients.

10.5 Conclusions

Inhaled corticosteroids are intended for long-term maintenance treatment and patient compliance is of major concern. This study is based on prescription data obtained from 13 pharmacies in The Netherlands. Patients are classified to be compliant if the use is between a lower level of 85% and an upper level of 130% of the prescribed regimen. This study shows that patient compliance with inhaled corticosteroids is poor. The largest group of the assessment of compliance patients (47.6%) is likely to underuse their medication. Only a limited number of these patients (7.7%) overuse their medication. Finally, 44.7% of these patients are found to be compliant to the prescribed dosage regimen of inhaled corticosteroids. Patient compliance increases by increasing age. Overuse remains unchanged in the age groups above 30 years. Differences in patient compliance are found, related to the used inhaler device. A higher percentage of overuse is found for the Turbuhaler and the p-MDI, both high-amount multiple-dose inhaler devices. A multi-dimensional analysis of the data shows that the largest group of patients was between 71-80 year and used a Diskhaler.

Agreements in a network, which includes general practitioners, pharmacists, as well as chest physicians, could be used to optimise patient education and counselling. This may result in an improvement of patients’ knowledge and perception about the use of the maintenance medication of inhaled corticosteroids, which finally improves the patient compliance.

10.6 Acknowledgements

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10.7 References


