

**Patients with underuse and overuse of inhaled corticosteroids have different perceptions and beliefs regarding COPD and inhalation medication**

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**Abstract:**

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**Objective:** To study perceptions and beliefs in COPD patients with poor adherence (and possible differences between under- or overuse) to inhaled corticosteroids (ICS).

**Methods:** Twenty patients (10 under-, 10 overuse) of the COMIC cohort study were interviewed using semi-structured in-depth interviews, containing questions on mental and physical health status, illness perceptions and knowledge regarding COPD and treatment factors like experience with, knowledge of, and acceptance of COPD medication and inhalation devices. Interviews were transcribed verbatim and analysed according to grounded theory.

**Results:** Overusers were less able to accept their disease. Several overusers hoped for improvement of the disease, which was not mentioned by underusers. Many patients showed signs of depression and fatigue, with overusers being more irritable and showing more grief about losing participation in daily life.

No patients completely accept treatment. Overusers reported time-consumption aspects and affects on daily life and described feelings of anxiety when medication is

not available, indicating dependency on medication. Underusers claim using less medication because they feel well and do not want to use too much medication, which corresponds to their belief that medication cannot prevent exacerbations. Overusers showed incorrect knowledge about dosing frequencies, using often more than prescribed. Overusers discard their device too early because they fear it's empty.

**Conclusion:**

Overusers and underusers showed a different pattern in perceptions and beliefs on inhaled medication. These differences need to be taken into account when we want to improve therapy adherence.

## INTRODUCTION

In the treatment of Chronic Obstructive Pulmonary Disease (COPD), therapy adherence is crucial not only for dealing with symptoms, but also for preventing exacerbations and related complications. Adherence to inhaled corticosteroids (ICS) has for example, been shown to be associated with reduced risk of death and hospitalization. (1) In order to achieve optimal adherence in COPD patients, it is important to recognize and understand a non adherent patient. This understanding can be used to guide a patient and try to help a patient optimize his adherence. Non adherence can present itself in different forms. After collecting medication the patient can underuse, overuse or show improper use of the medication. (2 3) Many adherence studies focus on non adherence registered as underuse. Overuse is an important form of non adherence as well. Specific for COPD patients, predictors for the risk of overuse of inhaled corticosteroids in the COMIC cohort were a lower FEV<sub>1</sub>, more anxiety for dyspnea as scored with the CCQ and current smoking.(4)

Therapy adherence in COPD patients is a multifactor problem. One has to take into account, for example medication, regimen and patient factors. In the COMIC study it was shown that adherence to inhalation medication in COPD is related to the type of inhaled medication and to the device with which the medication is inhaled. (5 6) Differences in adherence between medications could be explained, at least partially, by the noticeable effect of the medication and frequency of dosage. (7) Differences in adherence between inhalation devices seemed to be related to the design of the device. (8) For example, inhalation devices without a dose counter, devices with the ability to load a dosage without actual inhalation, or devices lacking feedback of correct inhalation showed more overuse.(8) Next to these medication factors, known patient factors that affect adherence are increasing age with related problems as

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increasing number of co morbid conditions, poly pharmacy, cognitive decline, physical problems as hand–eye coordination and problems with reading small print.(2) In the COMIC data therapy adherence to inhalation medication showed to be related to FEV<sub>1</sub> at baseline. Underuse was associated with a higher FEV<sub>1</sub> at baseline, while overuse was associated with a lower FEV<sub>1</sub> at baseline. It seems under- and overusers are different patients.

For understanding the influence of patient factors on adherence, Leventhal proposed a Self-Regulatory Model. (9) This model provides a framework for understanding adherence and non-adherence to treatment recommendations (10) and the theory is based on patient's beliefs of their illness in relation to treatment adherence. (9) The model asserts that illness beliefs are structured around five dimensions; illness identity, time-line, cause, consequences and control-cure. (11) Horne et al. showed for four chronic illness groups (asthma, renal, cardiac, and oncology) that beliefs about medication were related to reported adherence. Higher necessity scores correlated with higher adherence while higher concerns correlated with lower adherence. (10) The patient's perception of the disease and therapy is not yet described in much detail in literature concerning COPD patients. Are there beliefs, experiences, fears that influence the use of inhaled medication?

Horne et al. applied the Self-regulatory model of Leventhal to patients with asthma and the use of inhalation medication. They showed that non adherent behaviors (underuse) were associated with doubts about the necessity of the medication and concerns about its potential adverse effects and with more negative perceived consequences of illness. (12) Horne et al. therefore designed an extended self-regulatory model of treatment adherence, which incorporates beliefs about treatment as well as illness perceptions. (12) Although asthma and COPD are both diseases of

the lungs, asthma shows an intermittent process whereas COPD is a continuous process. We therefore believe it possible that COPD patients have different beliefs and perceptions than asthma patients.

**We aimed to investigate the beliefs and perceptions about COPD and the inhalation treatment in patients' non adherent to ICS.**

With the use of in-depth interviews this study primarily focuses on which components of the patient's perceptions and beliefs (based on the extended SRM-model of Horne et al) and practical issues specific for inhalation medication can explain the non-adherence to the inhaled medications prescribed for COPD.

**But instead of defining non-adherence only as underuse, we will also study factors related to overuse of ICS. Furthermore, we will compare the patients' perceptions of persons with underuse and overuse to see if these perceptions differ.** Studying patients' perceptions of both under- and overusers and comparing their perceptions is innovative in this field of research.

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## **METHODS**

### **Settings and study population**

This study is part of the Cohort on Mortality and Inflammation in COPD (COMIC) study, a single centre prospective cohort study in Enschede, the Netherlands. From December 2005 till April 2010, 795 COPD patients were included with a follow-up period of three years. The study was approved by the hospital's Medical Ethical Committee (P05-49). All patients provided written informed consent, including consent for collecting pharmacy records during the studied period and agreed to be contacted in the future for further research. To complement the current data with in-depth interview data this new part of the study was judged as non-WMO research by the hospital's Medical Ethical Committee (K15 08).

To be eligible for the study patients had to meet the following criteria; (1) a clinical diagnosis of COPD, as defined by the 2007 GOLD criteria (13); (2) current or ex-smoker; (3) age 40 years or over; (4) no medical condition compromising survival within the follow-up period or serious psychiatric morbidity and, (5) absence of any other active lung disease (e.g. sarcoidosis), (6) no maintenance therapy with antibiotics, (7) and the ability to speak Dutch. For more detailed information we refer to previous publications. (7 14)

### **Therapy adherence**

Therapy adherence for inhaled corticosteroids (ICS) was recorded from patients' pharmacy records. The patients were not aware that their medication records were used for the monitoring of therapy adherence. Theoretical duration of exposure was calculated using information on dispensing date, total supply, and dosage regimen. This was expressed as a percentage and adherence was deemed good if it was  $\geq 75$ -

≤125%, sub-optimal between ≥50- <75%, and poor below <50% (underuse) or above >125% (overuse).

**Patient selection:**

In order to study non-adherence ten patients who underused and ten patients who overused their ICS were selected from the COMIC cohort and were invited for an in-depth interview. All patients provided written informed consent. Because the collection of the COMIC data ended in 2014, patients last enrolled in the cohort were contacted first, no further selection criteria were used.

**Qualitative Study design:**

The interviews were conducted by two intensively trained psychology students (bachelor) at the patients' home or at the hospital if a patient preferred this. The interviews were semi-structured using an interview guide with a structure based on the extended self-regulatory model of Horne et al supplemented with "Treatment factors" like experience with and acceptance of COPD medication and inhalation device, next to knowledge of the used medication and inhalation device. Self management and demographic data concluded the interviews.

The interview guide was tested by the two psychology students in one interview each, training the students with multiple feedbacks. The scheme proved to be appropriate and the next 18 interviews were executed. Each student interviewed five participants with registered underuse for ICS and five with overuse.

The interviewers were blinded for the adherence pattern of the patient. Patients were sampled until a sufficient number to provide topic saturation (no additional topics emerged during the final phase of analysis) was reached.



## Data analysis:

The interviews were transcribed verbatim, data were imported in Atlas Ti version 7.5.15. Our approach was initially deductive, based on the five dimensions of the Self-regulatory Theory of Leventhal: illness identity, time-line, cause, consequences and control-cure. Followed by an inductive phase to reach saturation of analysis. Separate categories regarding specific medication issues in COPD patients were identified and coded, including knowledge and experience with medication and inhalation devices (Figure 1). During the coding process the authors were blinded for the patients' under or overuse. Initially the first author coded four interviews using a coding scheme. The coded scheme was adjusted by discussion of the coding in the research team. The second author coded four interviews to establish consensus. **The coded scheme (supplement) was adjusted again. A consensus of 80% or more was regarded as sufficient. Quotations of patients with under- and overuse were grouped per code in order to study the possibility of different patterns in quotations. The first two authors screened the grouped quotations independently for differences. Results were discussed in the research team for consensus.**

The results of the interviews are described per dimension of the model (Figure 1).

The numbers at the end of the quotations correspond with the patient number.

**Commented [KK5]:** @Christina, officieel hebben we hierna nog een keer twee interviews gedaan voor de 80% score. Hoe gedetailleerd moeten we dit beschrijven? Ook vermelden dat de labels zijn blijven staan bij de laatste ronde?  
Antwoord:  
HANGT AF VAN TIJDSCHRIFT

**Commented [BC(6)]:** Zoek voorbeelden in de tijdschrift op en probeer zo veel mogelijk hun stijl en informatie dichtheid te gebruiken

**Commented [KK7]:** @Christina, het blijft moeilijk om te beschrijven waarom we iets als verschil zien. Is dit voldoende?

1. Illness Identity	→Disease (description)
	→ Complaints / disease symptoms
2. Illness Timeline	→ Curability
	→ Course of the disease over time
	→ Future development/ hope
3. Illness Consequences	→Physical      →Complaints
	→Limitations
	→ Emotional   → Complaints
	→Limitations
4. Illness Cause	
5. Illness Cure/Control	→Coping      →Psychological
	→Practical
6. Treatment Necessity	→Acceptance/non acceptance
	→Memory; influence on adherence
7. Treatment Concerns	→Side effects
	→Dependency
8. Inhalation Medication use	→Knowledge inhalation medication
	→Experience with inhalation medication
	→Daily routine
9. Inhalation Devices	→Knowledge device
	→Experience with device

Figure 1: Self Regulatory Model extended with specific COPD treatment topics

## RESULTS

### Baseline characteristics

Table 1 shows the baseline characteristics of patients.

	Underuse (n=10)	Overuse (n=10)
Age (Median,range)	66.5 (63-81)	68.8 (5381)
Sex, number of males N (%)	7 (70.0%)	3 (30%)
Smoking status (n, [%])		
Current smoker	1 (10%)	3 (30%)
Ex smoker	9 (90%)	7 (70%)

### Lung function

Commented [KK8]: Nog opzoeken/uitdraaien zodra mijn SPSS het weer doet

### Interviews

#### 1. Illness identity:

The first dimension of the Self-regulatory Theory was illness identity, how a person viewed his illness. Most patients could not give a clear definition of COPD. The descriptions vary from emphysema to airway obstruction. The symptom most often described as typical for COPD was dyspnea. The interview data showed no distinct difference between under- and overusers.

A: Ja.. copd.. vernauwing van de luchtwegen.. kleine luchtwegen of zo iets dergelijks. Grote lijnen of zo. En dat wat de ontstekingen kan .. dat.. volgens mij dan hoor. **under593**.

A: Het is een longemfyseem. Waardoor de longblaasjes kapot zijn gegaan. Waardoor minder zuurstof opneemt in het bloed. **under722**

A: Ja.. ik ben altijd heel erg benauwd.. **over355**

A: Benauwheid. Dat is een hele grote klacht. **under722**

#### 2. Illness Timeline:

The factor timeline represents how the patient believes the illness will develop over time. Most patients (14) believed COPD cannot be cured. The most optimistic expectation was that the situation stays stable as long as possible. There was no visible difference between under- and overusers in beliefs about curability.

However, a difference between over- and underusers was a hope for improvement expressed by four patients with overuse versus none of the patients with underuse.

En beter worden doen we toch niet, dat weten we allemaal.. **under313**

Het wordt alleen maar erger, niet beter. **over767**

Nee, je kunt wel uuh.. door goede medicijnen te gebruiken .. kun je het nog wel een poosje zo houden, maar genezen niet. **over358**

Q: En denkt u dat het nog beter kan worden dan dat het nu gaat?

A: Ja, misschien dat er ooit nog betere medicijnen komen.. **over345**

Q: En denkt u dat de klachten die u heeft van de COPD nog minder kunnen worden?

A: Hoop het toch.. **over355**

Most patients perceived their condition as stable. The few patients that experienced improvement in their symptoms quit smoking or made a drastic change in lifestyle (e.g. weight loss).

A: Op het moment gaat het aardig stabiel **under593**.

A: Joa.. Ik voel me hartstikke goed zoals het is. Het blijft een beetje stabiel. **over664**

A: Naah, het is veel minder geworden sinds dat ik niet meer rook. **under207**

A: Want mijn COPD categorie is enorm verbeterd doordat ik enorm af ben gevallen. **under501**

Following this perceived stability, worrying about the future was equally distributed between under- and overusers. Half of the patients worried about the future (5 under-, 5 overusers).

A: Ja. Laatste jaren niet, maar ik heb toch wel is gehad dat ik toen een paar keer snachts zo benauwd was.. dat ik denk ja.. waar moet het heen? **under593**

A: Neuh, ik maak me er geen zorgen over.. Als ik zorgen maak, dat helpt toch niet. **over504**

A: Ja. Daar maakt ik me nog wel eens zorgen over.. **over664**

### **3. Illness Consequences:**

This component comprised patient's beliefs about the severity of their illness and its impact on physical, social and psychological functioning.

Physical problems mentioned most were dyspnea, shortness of breath, fatigue and cough. These symptoms influenced every day activities in COPD patients. Patients experienced problems with walking (long) distances and walking stairs was mentioned several times as being extremely difficult. There was no difference between under- and overusers in described symptoms or problems with every day activities.

#### ***dyspnea***

Bij het douchen is het wel het ergst. Dan ben ik helemaal buiten adem. **under207**

Als ik een paar meter loop ben ik al buiten adem.. **over355**

Nou, het beperkt me in eigenlijk alles, ik ben altijd kortademig.. **over504**

Altijd benauwd. **over664**

#### ***Fatigue***

Ik ben dan bekaf. Dat is eigenlijk met alles wat ik doe. **under207**

Ja, daar word je ook moe van.. ja, och natuurlijk. **over358**

#### ***cough***

A: Nou, soms als ik het heel benauwd heb en ik moet erg hoesten, ja dan beginnen die longen zo pijn te doen. **over345**

A: Ja, hoesten. **over504**

#### ***Problems with every day activities***

als je ergens bent ... ooh, je moet een etage hoger.. dan ga je niet zo maar de trap op. Dat lukt niet meer. Dat is taboe. **under362**

als ik bijvoorbeeld naar de wc loop, dat kan ik eigenlijks niet eens, dat lukt ja bijna niet meer...

**over355**

A: En in de tuin werken vind ik erg leuk. Maar als ik dan 5 minuten of 10 minuten bezig ben dan ga ik tussendoor wel weer zitten. **over625**

Als ik een keertje afwassen wil dan mag ik eerst wel een uur gaan liggen. Paar uurtjes wel, eerst even wat slapen. **over767**

Most patients (under and over users) experienced loss in their daily life activities.

They cannot do all the things they were used to do. Overusers showed more grief about losing participation in daily life.

En dan mijn kleinkinderen, ik kan niks met zo doen eigenlijk.. En dan vragen ze: 'Oma, waarom kun je niks doen?'... Dat vind ik ZO moeilijk... **over355**

Het belemmert zoveel in je leven, in je doen, in je zijn. Dat is soms wel moeilijk. **over625**

Patients with overuse were irritable more often (2 under-, 5 overuse)

Misschien ben je wel iets euh.. Ja, iets prikkelbaarder, dat wel. Dat zou wel kunnen wezen. **under207**

Q: En bent u de laatste tijd misschien ook wel eens wat sneller geïrriteerd, prikkelbaar of boos in vergelijking met eerder?

A: Eigenlijk wel. Want ik had kort geleden een keer een aanvaring met mijn zoon. **over625**

Some patients experience anxiety or a fear of dyspnea. (3 under-, 2 overuse)

Je bent zo beperkt. In eerste instantie, als je het hebt in het begin was het heftig hoor. Dat was angstig. Dat is echt angstig. Ja. **under362**

En daarvan heb ik ook een beetje die angst van me bij me... Van alleen zijn en benauwd worden. **over625**

Half of the interviewed patients (4 under-, 6 overuse) experienced symptoms of depression; other patients claimed no signs of depression.

Q: Ja.. De volgende vragen gaan over hoe u de laatste tijd in uw vel zit. Heeft u de laatste tijd wel eens last van sombere, depressieve gevoelens of hopeloosheid?

A: Jawel.. ja.. ja.. Zeker wel. **over345**

Q: En de eerste vraag die daar bij hoort is: Heeft u de laatste tijd wel eens last gehad van sombere, depressieve gevoelens of hopeloosheid?

A: Ja. Oh god. Alleen maar.. **over355**

Nee.. Neeee.. Dat speelt helemaal niet. Nee **over504**

Nee hoor. Daar ben ik het type niet voor. **over750**

**Commented [MB9]:** Je zou er ook voor kunnen kiezen om alleen de quotes van depressie weer te geven? Of moet het altijd beide kanten op? Misschien goed om even aan Christina voor te leggen?

#### 4. Illness Cause:

For the cause of COPD the majority of patients mentioned smoking as a possible cause (8 underuse, 8 overuse) next to a hereditary component, or a genetic predisposition for lung disease (4 underuse, 6 overuse) and environmental factors like pollution. Differences between under- and overusers were not detected.

##### **Smoking:**

Nou ja, ze hebben mij gezegd dat het door het roken komt. Nou, dan zou dat wel.. **under313**

Als je daar dan ook nog bij gaat roken en je hebt al slechte longen.. ik rookte dan helemaal niet veel, maar dat is wel duidelijk de oorzaak dat roken hoor. Slecht hoor. **over358**

##### **Hereditary:**

Het zal ook wel iets aangeboren wezen. Mijn vader had het ook wel. **under593**

Het is wel erfelijk. Het zit in de genen denk ik. **over710**

##### **Enviroment:**

Ik ben dan nog groot geworden in kolenpot. In het roergebied. Misschien ook wel door die lucht. **under362**

En stoffen hè. Bij ons op het werk, mijn vader had een eigen bedrijf, die was autospuiter ja... Zonder iets voor de mond en als ze dan de neus gingen snuiten.. moest je eens kijken wat een rotzooi dat erin zat. Dat adem je ook alleen maar in. **over358**

## 5. Illness Control/Cure:

These are the patients' beliefs about the amenability to control or cure the illness.

This component contains quotations on acceptance of the disease and coping with COPD by adapting behavior and using tools to improve daily life.

Only four patients described that they accept their COPD (3 under-, 1 overuse).

Seven patients reported accepting their disease since they feel that they have no other choice. (4 under-, 3 overuse). And eight patients cannot accept their disease (3 under-, 5 overuse). Overall patients with overuse were less able to accept their disease.

### **Acceptance:**

maar ik accepteer het gewoon. Daar heb ik geen moeite mee verder. **under207**

En het heeft heel lang geduurd dat ik dacht van jammer dat ik van alles niet meer kan. Maar ik zit nu wel zo van als ik wat doe en ik word moe, dan ga ik zitten. **over625**

### **Non acceptance:**

A: Ik kan het niet accepteren. Echt niet. Nee, ik kon vroeger nooit stil zitten. Kan ik nog niet, heb ik nog steeds heel veel problemen mee. **under460**

Q: Kunt u zich neerleggen bij het feit dat u COPD heeft of is dat moeilijk?

A: Nou, dat is wel moeilijk ja. Ik heb liever dat ik het niet heb.. En dat ik vrij alles kan doen. **over664**

Most patients used tools and devices to support their daily life activities; for example riding an e-bike. Next to this, patients paced activities in order to participate in daily life. There were no differences between under- and overuse.

Fietsen gaat wel, maar ik heb dan wel een elektrische fiets.. **under313**

Om de zoveel tijd ga ik even zitten waar een mogelijkheid is om te zitten. **under460**

Wij mogen heel graag fietsen en een elektrische fiets gaat mooi.. **over345**

Ik kan geen afspraak maken morgen, want morgen.. ik moet eerst de ochtend afwachten en dan kan ik zeggen noh.. ik doe dit of ik doe dat. **over358**

want je zoekt winkels op waarbij de winkelwagen heel dicht bij de parkeerplaats staan. Zodat je als maar zo'n wagen hebt dan gaat het prima. **over750**

Many patients had social support in their close network. Help from a partner, family or friends. For example; partners or guests smoking outside the house because they do not want to burthen the patient. When needed, the pharmacy offered support by delivering medication at home.

Q: En krijgt u hulp bij het ophalen van de medicatie?

A: Het wordt wel gebracht en anders dan haalt mijn schoondochter ze op. **over504**  
Niemand rookt hier in huis en daar waar ik naar toe hen ga ook niemand. **under362**  
Ik heb een schat van een vrouw. Die ondersteunt me met alles. **under460**

## 6. Treatment Necessity:

This component shows the quotations of the patients concerning beliefs about the necessity of the medication and attitude of the patients toward the medication. None of the patients completely accept their inhalation treatment. Underusers claim using less medication because they feel well or because they do not want to use too much medication. Overusers reported using medication took too much time, being forced to think of the use of medication during all day and its affect on daily life activities.

### **Acceptance of necessity of treatment**

Ik ben blij dat ik het heb, want als ik het niet gebruik dan ben ik een stuk benauwder. En ik heb er geen moeilijkheden mee.. **under501**

A: Ja, dat gaat dat vind ik ook niet zo moeilijk. Als ik het niet doe word ik wel benauwd he.. Nee, dat gaat hartstikke goed joh.. **over345**

### **Non acceptance of necessity of treatment**

Q: Wat denkt u over uw medicatie?

A: Ik vind het wel verschikkelijk.. **over664**

A: Ja, neemt een heleboel vrije tijd in beslag en ja eigenlijk word ik er moe van. Ik baal er van als een stekker. (...)

A: Ja, het is heel lastig. Je moet ze innemen, maar anders zou ik ze uit het raam gooien. Anders heb ik mezelf ermee. **over767**

### **Reported underuse:**

Eigenlijk vier keer, maar omdat ik sochtends een dubbele portie neem.. ik moet natuurlijk niet te veel van hebben. Daarom doe ik het dan vaak drie keer. **under362**

's Avonds vergeet ik de inhalator nog wel eens een keer omdat het gewoon hartstikke goed gaat, maar dat kan ik mij ook wel veroorloven. (...)

A: En als ik merk als het wat minder is, dan gebruik ik het weer wat frequenter zegmaar. **under501**

A: Ja. In zoverre.. de apotheek zegt tegen mij: je is wat vaker die inhalatie nemen, want je betreft te weinig. Nou, dat doe ik dan net niet. **under690**

Kijk maar je moet niet te veel medicijnen nemen.. **under593**

### **Reported overuse:**

Ik heb spuitbusjes bij me. Voor het geval dat. Dan neem ik wel is een keer een pufje extra als wat voorgeschreven staat **under719**

Some patients experienced memory problems. Most of them claimed this did not



affect their medication use. The patients that acknowledged they sometimes forgot to use their medication were mostly underusers. Overusers claimed they did not forget, because they needed the medication.

En heeft dat ook invloed op uw medicatie inname bijvoorbeeld? Dat u dat wel eens per ongeluk vergeet?

A: Nee, nee. **under207**

Q: Oke. Kunt u dingen nog goed onthouden?

A: Nee. Totaal niet. Echt niet. Het is net een zeef. Dat is lastig ja.

Q: Oke. Heeft dat ook invloed op de medicatieinname?

A: Ja, natuurlijk.. **under362**

Toen ik nog werkte vergat ik het nog wel eens.. **under460**

A: Neee, dat vergeet ik nooit. Daar kan ik niet zonder. **over345**

Q: Ok. En met de medicatie? Heeft u wel eens dat u per ongeluk vergeet uw medicatie te gebruiken?

A: Heb ik heel enkel. Dat ik denk van: 'Heb ik hem nou ingenomen, of niet?'. **over625**

## 7. Treatment concerns:

The next quotations show the possible concerns for adverse effects and the patients' experienced side effects. Some patients reported that they experienced side effects and in a few cases they received substitution medication to overcome this. Mentioned side effects were hoarseness, irritation of the throat and coughing.

### *Side effects:*

Hees van worden. **under593**

Zoals die spiriva.. het nadeel dat het direct de keel wat irriteert. **under719**

droge keel en dan krijg je er een hoestpartij er soms bij. **under719**

heb een keer een medicijn gehad en daar moest ik van hoesten.. **over358**

Underusers believed they needed the inhalation medication in order to experience less symptoms. In contrast, overusers reported medication "dependency" in the sense that they tend to catastrophe when being without medication, e.g. patients reported they do not go anywhere without their medication, they feel safe when carrying their medication and some claimed that they panic when they forgot to take the medication with them.

### *Medication dependence:*

Dus ik zou denkik ook niet zonder die medicijnen meer kunnen.. **under501**

Commented [KK10]: Deze eruit laten ivm de omschrijving hierboven?

Heel belangrijk. Ja, heel belangrijk. Zonder die medicijnen zou ik denk ik niet kunnen. **over345**  
Dat medicijn? Omdat je dan nodig hebt. Als ik weg ga en ik merk dat ik dat ding niet bij me heb dan raak ik in paniek. **over358**  
Ja, nee maar, vooral hie. Ik heb er altijd één in de auto liggen daarom. Maar als ik nou hier ga dan steek ik hem in zak, want je weet nooit wat er met de inspanning gebeurt. **over668**  
Dat geeft je toch een bepaald gevoel van veiligheid als je het bij je hebt. **over750**

## **8. Inhalation Medication use:**

This component contains the results concerning knowledge on the effect of and experiences with the use of inhalation medication. The knowledge regarding the inhalation medication was diverse. Most patients were able to describe an effect of medication for example anti inflammatory or relieving dyspnea. But some patients were not able to describe which effect belonged to which medication. Especially overusers reported knowledge of their medication that was wrong. For example saying medication was anti inflammatory while it was a short acting beta agonist, or thinking a medication was short acting (had to be taken every few hours), while it was long acting and had to be used once or twice a day.

### **Correct knowledge:**

ik gebruik daar medicijnen voor om de luchtwegen te verwijderen en ontstekingsremmend. **under460**  
En dit is meer voor ontstekingsremmen, dat is Seretide.. **over345**  
A: De medicijnen zijn om het stabiel te houden. **over625**

### **Wrong knowledge:**

Ventolin was dat en dat was een ontstekingsremmer **over625**  
Q: En is 1 van die medicatie ook voor het moment dat u benauwd wordt dat u die dan op dat moment kunt gebruiken?  
A: Ja, de seretide. **over664**  
A: Die speriva elke 3 a 4 uur eigenlijk. **over664**  
als ik verkouden ben dan neem ik seretide een keer extra. Dan kan ik beter hoesten. **over710**

A striking result was the perception of several patients (4 under- , 2 overuse) that the medication was not able to prevent exacerbations or to slow down disease progression which is the main reason for prescribing ICS in COPD.

Q: Ja.. Ok.. Maar denkt u dat die opvlammingen voorkomen kunnen worden door de behandeling?  
A: Nee, dat denk ik niet. **P 7: under460**

Denkt u dat de behandelingen de plotselinge opvlammingen minder kunnen maken? Dat dat minder vaak voorkomt..

A: Neuh. Nee, ik zou niet weten waardoor dat zou kunnen **under501**

Although the knowledge of the used inhalation medication is divers and sometimes incorrect, all patients experienced positive effects of the medication.

A: Ja, dat is het verlichten van de benauwdheid. Dat doet het zeker. **under460**

Het geeft een beetje verlichting, ik wordt wat minder benauwd. Ik heb er dus wel hulp van. **under480**  
Noh en dan neem ik die medicijnen in, ik heb zo'n voorzetding en blaas je het in en dan krijg je weer lucht. En dat is echt fijn hoor! **over345**

Ja, dat je wat minder benauwd wordt en het wat lichter wordt.. **over504**

Most patients claimed that they used their medication in a daily routine (9 under-, 8 overuse). Two patients with overuse described they did not have fixed times on which they took medication.

**Daily routine:**

A: Ja, dat gaat automatisch, maar ja die dingen gebruik ik ook al zo veel jaren. Echt dat gaat gewoon automatisch. **under719**

A: Ja, het is zeker een routine.. Ik hoef er niet bij na te denken. **under313**

A: Ja, gaat allemaal automatisch.. **over664**

A: smorgens, gebruik ik ze en dat is altijd een vast patroon.. **over710**

**No routine:**

Ok. De volgende vraag is: Op welke tijdstippen gebruikt u de medicijnen?

A: Ja, dan kan dus op iedere tijdstip van de dag zijn.. **over504**

A: Nee. Geen vaste tijdstippen. Smorgen voordat ik uit bed ga neem ik dit in en dan gaat hij de hele klok rond en dan tegen de avond dan is die soms uitgewerkt en soms ook niet. En dan neem ik deze erbij, maar verder van de rest.. **over750**

**9. Inhalation devices:**

The knowledge about functioning/handling of the inhalation devices was low.

Especially knowledge on how to define that a device was empty was stated incorrect by many patients. Patients with registered overuse seemed to discard their inhaler too early just to be sure they inhaled medication.

A Metered Dose Inhaler (MDI) is an inhaler, a patient can still actuate with little or no drug beyond the maximum number of dosages left in the canister. Patients with registered underuse answered they used their MDI until it stopped, which is using the inhaler too long after it has released its last dosage.

**Discarding too early:**

Q: ziet u eigenlijk of de inhaler leeg is?

A: Ik kan het merken he.. als ik denk: hij gaat een beetje stroef. Dan spuit ik een keer en dan oh god, er zitten er nog één of twee in. Dat doe ik wel is vaker. Dan is die leeg. **over358**

A: Nou, dat zie ik bij de Oxis, dat geeft een dingetje aan. Die geeft een rood seintje aan van: als die bovenaan staat, nou dan kan ik nog wel een aantal keren innemen, maar als die in het midden staat dan doe ik hem weg. Soms denk ik wel eens misschien doe ik hem te vroeg weg, maar ik ben dan bang dat ik niet voldoende binnenkrijg. **over625**

Komt er nog een heel klein beetje uit, dan gooi ik hem gewoon weg. En dan doe ik er weer een nieuwe in. **over345**

**Discarding too late:**

A: Ja, als er niks meer uitkomt dan is het tijd om een nieuwe te pakken. **under719**

A: Ja, dan schut ik en als ik denk van nou.. daar zou wel is eens niks meer inzitten .. ik heb ook al is een keer geprobeerd om te wegen, maar dat werkte niet.. met zo'n huishoud weegschaaltje niet... en dat wil dus niet, maar ik kijk dus even en als er nog wat uit komt dan weet ik dat die goed is. **under719**

Patients using devices with a dose counter knew when their device was empty. Next to this, there were patients that were able to use devices without a dose counter by using a note on the calendar reminding them when to discard the device.

**Knowledge device (when empty):**

A: Als dat stukje rood wordt, dan is die leeg **under207**

En hoe ziet u of de inhaler leeg is?

A: Dat staat op de achterkant. Daar zit zo'n tellertje op. **under501**

Op het laatst dan denk ik: 'ja, volgens mij zit er niet meer wat in...'. Ik geef na het aantal keren dat je ze moet gebruiken, noh dat gaat gewoon per maand. Dan schrijf ik gewoon de datum er op... Is de datum om dan gooi ik ze weg en pak ik een nieuwe.. **under313**

A: Kijk, hier staat: Nog 5 pufjes. Zie je dat? De Seritide is dat..

Q: Ja..

A: Noh, dan kan ik hem als die leeg is weggoeien en een nieuwe pakken.. **over345**

A: Noh.. de Spiriva.. Die wordt dan helemaal rood.. Dan kun je niet meer draaien.. **over345**

A: de Flixotide.. Daar zet ik altijd de datum op wanneer ik begin. **over625**

In contrast with the lack of knowledge on the function of the device, patients experienced the use of the device overall as easy. Some patients had negative experiences with a specific device for example not enough inhalation flow to inhale the medication. One patient claimed he did not like the spacer. And a patient with overuse claimed a MDI did not release the dosage as wanted.

**Positive experience:**

gewoon makkelijk in gebruik ja. **under207**

Nee. Nee, nee, maarja, door het jarenlange gebruik van medicatie, vooral op het gebied van COPD, is het gewoon routine en is het niet moeilijk en zijn er geen moeilijkheden. **under460**

A: Nee, het is erg makkelijk te gebruiken allemaal.. **over345**

omdat ik veel meer met de inhalatie in en uit blazen weet je wel dan gaat dat veel beter.  
(voorzetkamer) **over767**

**Negative experience:**

heb ik wel, maar dat heb ik alleen gebruikt omdat die andere was eentje waarbij ik moest inademen..

Daar had ik de kracht niet voor.. **under313**

nou, zo'n voorzetskamer vind ik niks. **under719**

Het leek wel net of dat ding leeg is en toen zal ik vast ook wel een paar keer voor niks gebruikt hebben. Dat is heel vervelend. Dan spuit ik onder tafel weet je wel. Der kwam totaal niks meer uit. Een week erover of zo had ik dat ook al geprobeerd en toen er kwam nog wel één uit. Dat is heel nadelig. **over767**

## Discussion:

Aim of this study was to investigate the beliefs and perceptions about COPD and the inhalation treatment in patients' non adherent to ICS.

Our main results were that patients were not able to accept their disease, showed little knowledge on their disease, and many patients showed signs of depression and fatigue. Underusers claimed using less medication because they felt well, did not want to use too much medication and reported to use inhalation devices too long after they were empty. Whereas overusers showed more grief about losing participation in daily life, were irritable more often, did not follow prescriptions by using more than prescribed and discarded inhalation devices too early because they feared to run out of medication. These differences and mentioned practical issues provided explanations for the registered under- and overuse.

The majority of the patients were not able to accept their disease. Menckeberg et al. showed a relation between ICS attitudes and adherence in asthma. Adherence rates in pharmacy records were highest for the patients accepting treatment. (19) It is possible the registered non adherence could be (partially) explained by this non acceptance.

George et al. showed that adherent patients had a greater understanding about their illness and the options for managing the illness. (15) Perhaps the interviewed patients showed non adherence because they had little knowledge on COPD. The interviewed patients mentioned external factors as causes of their disease, for example; genetic predisposition and pollution. Smoking was mentioned most often but frequently with adjectives as possibly or maybe. Almost none of the patients claimed smoking as the real cause of their COPD. Jessop et al. showed that asthma

**Commented [KK11]:** Er werd gewerkt met een gemiddeld therapietrouwpercentage. De mediaan was rond de 70%. Kan niets terugvinden over over-dan wel ondergebruik.

**Commented [MB12]:** Hier ook gekeken naar overusers?

**Commented [KK13]:** Literatuur Coping mechanism?? Functional coping -> gebruik elektrische fiets etc. literatuurstuk Schlusser nog niet gevonden

patients who believed that their asthma had been caused by external factors were less likely to adhere. (16) Perhaps this is the case in COPD patients as well.

COPD has a large impact on patients. Most patients experienced loss in their daily life activities with overusers showing more grief about losing participation in daily life.

Williams et al showed COPD patients find engagement in specific activities to be very important (e.g. walking, household maintenance) (20)

Depression is a known factor in non adherence to medication. (17) Turan et al found that the presence of depressive symptoms led to decreased adherence in patients with COPD, which could be an explanation for non adherence in this cohort. (18)

COPD patients with underuse of ICS showed a different pattern in perceptions, beliefs and knowledge on inhaled medication when compared to overuse.

Previously published COMIC data showed that an increase in FEV1/VC ratio was a predictor for underuse of ICS and that a better lung function was related to underuse.(4 7) These findings suggest that a better lung function predisposes patients to decreased use of their medication, possibly because of experiencing less respiratory symptoms. Maybe the effect of the medication is less missed, explaining the possibility of using use inhalation devices too long after they were empty. .

Patients with overuse differed from patients with underuse; they were even less able to accept their disease. Several overusers hoped for improvement of the disease, which was not mentioned by underusers. Previously published COMIC data showed that overuse was related to a worse lung function, this could possibly explain the wish for improvement.(7) Overusers claimed using often more inhalation medication than prescribed. This overconsumption could be triggered by experienced symptoms. The

lower lung function could also be an explanation for the dependence on inhalation medication. Overusers stated not wanting to leave the house without medication because of fear of dyspnea. This finding is supported by previously published COMIC data in which was shown that more anxiety for dyspnea, as scored with the CCQ, was a predictor for overuse. (4) The lower lung function and fear for dyspnea could also be an explanation for discarding devices too soon.

Another explanation for overuse can be that patients perhaps did not understand the way a device is constructed and therefore could not trust the device in giving the expected/wanted dosage and discarded their device too early because they were afraid it was empty. LaForce et al. for example, showed that a dose counter relieves anxiety about running out of medication. (21) Next to this devices with a dose-counter were related to higher adherence. (22)

#### *Limitations:*

A weakness in this study is the omission of data on patients with optimal use. It is possible patients with optimal use share perceptions and beliefs with patients with under- and overuse. Next to this the interview data and pharmacy data are not collected in the same research period. The pharmacy data are several years older. Although this is a weakness, medication use is shown as stable behavioral pattern over time (add REF) and therefore the interview data could give insightful information.

The interviewed underusers contained “verhoudingsgewijs” more male and ex smoking participants compared to the cohort data. The overuse participants were more females and less smokers compared to the original cohort making this a not representative sample.

**Commented [KK14]:** Ik kan alleen maar referenties vinden over het verbeteren van therapietrouw. Iemand een suggestie hoe dit beter te omschrijven is met een goede referentie?



The design of the study cannot prove causality. Detection of differences between under- and overusers in qualitative data and relatively small sample sizes is difficult but it gives indications of underlying cognitive and behavioral causes of under- and overuse which could inspire future research on clarifying and differentiating under- and overuse for inhalation medication in COPD in larger samples with quantitative research methods.

*Strengths:*

A strong point of this study is the qualitative design with in-depth interviews using the theoretical model for self-regulation and the fact that the authors were blinded for under- or overuse during the coding process as well.

Saturation of topics was reached with the twenty conducted interviews. Using a top down analysis, followed by a bottom up approach ensured an optimal extraction of results describing issues related to inhalation medication use in COPD patients. If a patient is non-adherent, the adherence can be related to personal motivations and experiences to use his medication different than prescribed and to practical problems with for example an inhalation device. These issues cannot be researched with pharmacy records because these records can give only an indication of drug refill patterns but not of the actual inhalation. Interview data can provide this useful insight. The innovative comparison of under- and overuse revealed differences in beliefs, perceptions and knowledge concerning medication and inhalation devices. To our knowledge little research is available on disease- and treatment perceptions specific for COPD patients, especially with a focus on practical issues in inhalation medication use.

**Conclusion:**

Non adherence in COPD is a multi factorial problem concerning behavior issues possibly caused by the underlying disease and practical issues specific for inhalation medication and the used devices. Overusers and underusers showed a different pattern in perceptions and beliefs on inhaled medication. When under- or overuse is detected, for example in a pharmacy, it is important to investigate the underlying problem. Is the under-or overuse related to a practical issue regarding knowledge on the inhalation medication or device or is the adherence influenced by beliefs and/or anxiety concerning the underlying disease or medication? These issues need to be addressed when we want to improve therapy adherence. Future research is warranted to investigate whether improving underuse and overuse need different approaches to improve adherence.

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