

## Prevalence of users of medication targeting obstructive lung disease, the reasons for prescriptions and the use of spirometry in Upernavik Health Center in the period from 2011-2016, a retrospective observational study as basis for future quality development

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### ABSTRACT

Chronic obstructive pulmonary disease (COPD) is a health problem globally. Smoking is a risk factor. In Greenland over 50% are smokers. Upernavik Healthcare Center serves the town of Upernavik and its 9 remote settlements. Many patients were treated with medications targeting obstructive pulmonary disease (ATC code R03). This retrospective observational study estimated the prevalence of users of R03 medication aged 50 years or above, investigated if spirometry was performed, the reason for prescription and smoking status. The study is based on review of data from the electronic medical journal. Permanent residents with prescriptions of R03 medication within a period of 5 years were included. Reasons for prescription and smoking status was registered. The prevalence of users of R03 medications was 7,6%. 37,8% had a spirometry performed. The reason for prescribing varied from no reason to COPD-like. R03 medications were prescribed years before spirometry. 37,8% of the patients were smokers. Prevalence of users was comparable to other studies in Greenland. There was lack of spirometry and a discrepancy to guidelines. Patients had prescriptions of R03 medication years without a specific diagnosis. This warrant a new strategy for identification, increase of spirometry and treatment of patients with COPD to be developed.

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The district of Upernavik Healthcare Center in the northwestern part of Greenland is unique as most of the inhabitants, in total 2679, of which 1629 persons live in 9 minor settlements spread over a huge area and only 1050 persons, or 39% of the population, live in the Town of Upernavik [12]. These settlements are only reachable by boat or helicopter. The objective for the Greenlandic Healthcare System is to deliver equal access to healthcare of equally high quality, regardless of where the patient lives. This ambition faces many challenges due to the great geographical distances, infrastructural barriers, such as unpredictable weather conditions and a constant flow of employees at all levels, which challenges routines and continuity.

The work as a district physician at Upernavik Healthcare Center is often challenged in the decision-making process concerning patients with severe lung disease such as chronic obstructive lung disease COPD. You must often determine whether patients can be treated and observed properly at distance in the settlement or have to be evacuated to the healthcare centre

in Upernavik by helicopter? And what if the weather is a hindering for flying or sailing, which can be a reality in days or weeks. This challenge may lead to inequality in healthcare, diagnosing and treatment of patient in the town of Upernavik and in the nine remote settlements.

It is known that more than 50% of the adult population in Greenland are daily smokers, and therefore, COPD is expected to occur frequently [3]. According to the international guideline as Global Initiative for Chronic Obstructive Lung Disease GOLD [4], a diagnostic spirometry is the golden standard when diagnosing obstructive lung disease and GOLD points out, that 'a clinical diagnosis of chronic obstructive pulmonary disease (COPD) should be considered in any patient, who has dyspnea, chronic cough and/or sputum production and a spirometry is required to make the diagnosis in this clinical context, where smoking also is a risk factor. The presence of a post-bronchodilator forced expiratory volume (1 sec)/forced vital capacity (FEV1/FVC) less than 0.70 (a diagnostic spirometry) confirms the presence of persistent airflow

limitation and thus of COPD'. A post-bronchodilator spirometry is required for the diagnosis and assessment of severity of COPD [5].

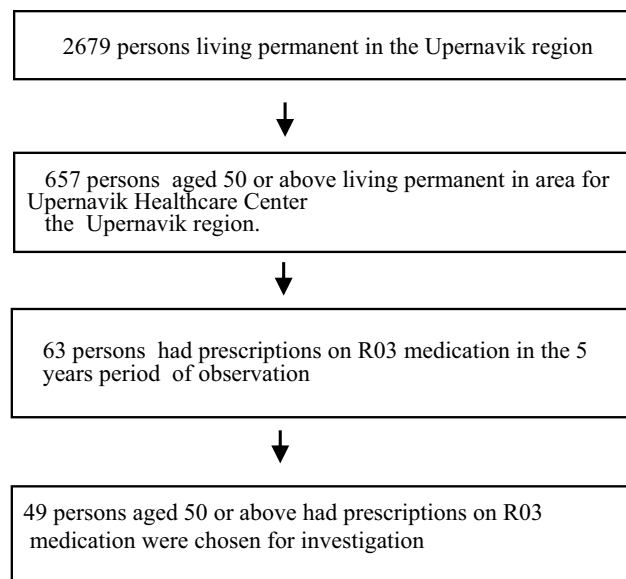
A cross-sectional study from Greenland published in 2013 [6] focused on the prevalence of users of medications targeting obstructive lung disease in the six largest cities in Greenland. Upernavik was not included. The medications were defined according to the Anatomical Therapeutic Chemical (ATC) code R03 and registered in the electronic medical records (EMR) if prescribed. They found a prevalent medication use of 6.3% among the population aged 50 or above, and among those only 14% had a spirometry performed within the last 2 years. Another study from Greenland published in 2016 [7] covered the same population as the study mentioned above and found the prevalent use of R03 medications among people of age 50 and above had risen to 7.9% and that 34.8% of these users had a spirometry test performed within the last 2 years. The authors concluded that the studies indicated an increase in the use of spirometry in the population from 14% to 34.8% in the period from 2011 to 2015. Fifty percent of patients with a spirometry performed had a FEV1/FVS < 70%, indicating COPD, but no information whether it was a diagnostic spirometry or not. They concluded that it might have been an effect of the implementation of a national lifestyle project [8–10].

In 2011, Upernavik Healthcare Center joined the national lifestyle project, which focused on diabetes, hypertension and COPD. It has been shown earlier that more than 80% of the Greenlandic population has been in contact with the primary health care system within the last year [11], so it was anticipated, that most of patients with COPD-like symptoms in the district of Upernavik would have been in contact with Upernavik Healthcare Center within the period from 2011 to 2015. After Upernavik joined the lifestyle project in 2011, we began to look into what impact that might have had on use of R03 medications and possible identification of COPD patients between 2011 and 2015. In 2015, there were no exact knowledge about the prevalence of COPD or the use of spirometry in regard to COPD in Upernavik.

The aim of this observational study was to estimate the prevalent use of R03 medication targeting obstructive pulmonary disease among patients aged 50 years or above and the extent to which spirometry was performed. Furthermore, we looked for the reasons for treatment with R03 medication, the smoking status and to see to which degree the indicators for COPD [5] have been met among the identified patients.

## Material and method

Criteria for inclusion were residents aged 50 years or above living permanent in the district of Upernavik in Northern Greenland and who had been prescribed R03 medications targeting obstructive pulmonary disease in the period of 1 January 2011–31 December 2015. From the National Greenland Statistic [1], we extracted the total population and the number of persons aged 50 or above living in the area as showed in the diagram below.



The reason for choosing the target group aged 50 years or above was to compare our results with the two studies from Greenland [6,7]. The electronic identification of the patients took place in November and December 2015 where prescription data were extracted from the EMR system for ATC-code R03 medications, which include short-acting and long-acting bronchodilators (SABA and LABA), long-acting anticholinergic drugs (LAMA) and inhaled corticosteroids (ICS). For every one of the 49 patients found eligible for inclusion, the EMR notes were reviewed for information about the indication for prescribing R03 medication, if spirometry was performed, information about COPD indicators and smoking habits and information about referrals to the hospital department, ambulatory consultations or referrals to the lifestyle unit, as well as. All spirometry measurements was performed using a Midmark IQspiro® (Midmark Diagnostic Group, Gardena, CA, USA). All spirometry records were reviewed to see if they were performed as a diagnostic spirometry and if the diagnosis COPD was established.

## Results

In total, 64 patients were identified to have received prescriptions on R03 medication, in the observation period. Forty-nine patients fulfilled the inclusion criteria of aged 50 years or above. After reviewing the EMR, notes and spirometry results journals the informations could be categorised, as seen in [Table 1](#)

In total, 49 patients aged 50 years or above were identified as having received prescriptions for R03 medication in the 5-year period from January 2011 to December 2015. The mean age of the patients was 64.2 (SD  $\pm$  9.35) with no statistical significant difference between genders.

The prevalence of users of R03 medications was 7.4% (49/657) as 657 persons living in the area were aged 50 or above at 1 January 2016. Eighteen patients had a spirometry performed within the last 5 years, and 15 patients had a diagnostic spirometry registered. Nine of these patients had a FEV1/FVC < 70% indicating COPD. For 35 patients had treatment with R03 medications been ordinated 0.2–11 years (mean 4.17) before any spirometry was performed or before the identification in this study. The reason for prescription was based on a clinical assumption.

In the EMR, there were no specific notations about the COPD indicators pointing to the diagnosis of COPD, but there were notes regarding the clinical symptoms in about half of the patients, as seen in [Table 2](#). In the other half, it was simply noted that medicine was prescribed or renewed.

Reasons for prescribing R03 medication were noticed in the medical record for 45 patients, and no information available in 5 records, as seen in [Table 3](#).

Smoking status was usually mentioned at the first time the patient was prescribed a R03 drug. Seven patients had given up smoking. 38.7% of the identified patients were smokers, 6% X-smokers, and 26.5% were non-smokers ([Table 4](#)).

The patients had been prescribed medications as mono-or combination therapy, as shown in [Table 5](#). For ICS, it could be alternating between ICS as mono component, or ICS combined with LABA.

## Discussion

In the present study, we focused on persons aged 50 or above to be able to compare our results with the two studies from Greenland published in 2013 [6] and 2016 [7]. In the area covered by Upernavik Healthcare Center with its nine settlements, the demography of the inhabitants is comparable to the population in the two other studies, as the people in Greenland can be seen

as indigenous Inuit people [12], and having a high rate of smoking.

In the present study, the prevalent use of ATC-code R03 medications for patients aged  $\geq$  50 years was 7.4%. This number is equal to the result from two other studies from Greenland [6,7], which found the prevalence of users of ATC-code R03 medications of patients  $\geq$  50 years to be 6.3% and 7.9%.

This is a measure of the number of cases of a condition in the entire population aged 50 years or above and as such the point prevalence [13]. About the prevalent use of R03 medications, we did not group the identified patients in age groups to verify, if there was an increase of users in older age groups parallel to patients with COPD as pointed out in a systematic review and meta-analysis from Scotland 2015 [14,15]. In the present study, we focused on spirometry with FEV1/FVC < 70% as a post-bronchodilator value as stated by GOLD, to find users of R03 medication aged 50 years or above, that might have COPD. Other diagnostic parameters have been evaluated elsewhere and could have been used, as discussed in connection with screening for COPD in asymptomatic and symptomatic patients, without knowing of having COPD [15,16]. However, the prevalence of users of R03 medication is not the same as the prevalence of COPD. In our study, nine patients with a FEV1/FVC equalling less than <0.70, indicating COPD, were identified. This gave a prevalence of COPD of 1% (9/657). However, this did not correspond to the experience gained from the daily work or from the clinically impression of patients with respiratory difficulties in Upernavik.

In one study from 2015 among Canadian Inuits [17], the prevalence of COPD was found to be 10.1%, and in a study from 2016, the estimated worldwide prevalence was 9–10% [18]. A Danish study from 2009 found that the prevalence of COPD was 12% among patients aged 45–85 years [19]. In an article from 2019 'Geographic distribution of COPD prevalence in the world displayed by Geographic information System maps' [16], it is pointed out that the prevalence in Greenland is unknown due to lack of data. In Greenland, the prevalence of COPD was still unknown in 2016 and 2019.

Fifty-seven percent of the population in Greenland were daily smokers in 2014 [3], and 37.8% percent of the patients in our study using R03 medications were actively smoking, when they got the prescription. Of these seven stopped smoking. Twenty-six percent were non-smokers, and we had no information about the smoking status from 20.4% of the included patients. This might lead to an anticipation of a higher rate of

**Table 1.** Specifications of patients aged 50 or above. Age, gender, prevalence of users of R03 medication, use of spirometry and length of medication without a specific diagnosis.

Variables	Total % (95%CI) (n/N)	Number of patients aged 50 or above	Mean age (SD)	Prevalence of R03 medication use within 2011–2015	No. pts. with spirometry performed within 2011–2015	No. pts. with diagnostic spirometry performed within 2011–2015	FEV1/ FVC < 70%	No. of pts. with medication prescribed after spirometry	Length of medication use before Spirometry or registration years (95% CI) (n/N)	No. of pts. with medication prescribed after spirometry
Total	7.4% (49/657)	49	64.2 (±2,62)	7.4% (49/657)	18	15	9	14	35 pts (2 mdr – 10 år) Mean = 4,17 (± 1,19)	14
Women	13.3% (39/292)	39	64.8 (±3,04)	13.3% (39/292)	13	11	8	10	29 pts. Mean = 3,28 (±1,26)	10
Men	2.6% (10/382)	10	61.6 (±3,04)	2.6% (10/382)	5	4	1	4	6pts. (Mean = 4,16, (±1,07)	4

**Table 2.** No. of patients where indicators for COPD was mentioned in the EMR.

Symptoms: dyspnoea, chronic cough and/or sputum production	Spirometry with comments on airflow limitation	Risk factors ± (smoking) and others.	No. of exacerbations the last year was mentioned
20	10	40	0

COPD. The fact that seven actively smoking patients stopped smoking after they were prescribed R03 medications might indicate that some conversation about smoking as a risk factor and the importance of smoking cessation have taken place, either in the lifestyle unit at the healthcare centre or in a consultation with the physician. In a benchmarking report from 2011 to 2013 [10] from the central lifestyle group in Nuuk, it was mentioned that 31 patients in Upernavik had prescriptions for ATC-code R03 medications, 2 patients had spirometry performed and 4 patients had a registration of their smoking status. After 2013, there was only unsystematic activity in the lifestyle unit at Upernavik Healthcare centre and no rapport could be found. Some organizations might have been made without any registration, and thus, the registered prescriptions might have been underestimated.

In the patients EMR, the conditions leading to prescription of R03 medication were described as merely dyspnoea or diffuse breathing difficulties or 'known as COPD' without further specifications of this statement, before a treatment with R03 medication had been prescribed or renewed.

After 4 years with the mentioned lifestyle project in the Upernavik area, the prevalence of COPD was still unknown. If one anticipates that the COPD prevalence was around 7%, in the Upernavik area on 1 January 2016, it might lead to the estimation that 45 persons would fulfil the diagnosis COPD, but only 9 were recognised in our study. The lack of spirometry investigation as a tool in the diagnostic process of COPD was obvious, even though there has been an increased focus on obstructive lung diseases in Greenland since 2011. Examples of this are the

deployment of the lifestyle project and implementing a digital tele-medico system called Pipaluk including digital spirometry, which were distributed to all towns and settlements with more than 50 inhabitants.

In the present study, 18 patients had a spirometry performed after consultation with a doctor or or after referred to the local hospital department because of serious respiratory symptoms. In general, the strategy for referring patients to a spirometry was uncertain. In the EMR, a few patients were regarded as having COPD on clinical background or for two patients after a single peak-flow test. There were no further informations regarding this diagnostic statement or any assessment of the impact of the symptoms in the person's life, except 'difficulty in breathing, or coughing and expectoration'. A study from 2015 [20] has documented that general practitioners (GP's) underestimate the seriousness of COPD, when a spirometry not had been performed. Even a correct diagnosis based on spirometry would be of little importance if not followed by correct treatment according to guidelines in terms of smoking cessation, medical treatment and physical activity [21].

Fourteen patients, who had a spirometry performed, had their first prescription on R03 medications after the spirometry was performed. For 35 or 71% of the patients, the treatment with R03 began years (mean 4.17 years) before the study began, and long before a specific diagnosis was obtained, but with reasons for treatment as seen in Table 3. Such a diagnostic delay has also been shown in studies from Denmark [2,21] and among Inuits in Canada [17,22]. The study from Greenland from 2016 [7] showed that only 34.8% of the patients receiving R03 medication had spirometry performed, and in the target group of patients aged 50 or above in Greenland have been prescribed R03 medications without a proper diagnosis. Looking at the medication prescribed in the present study, there were 11/49 pts. receiving monotherapy with SABA and 38/49 treated with ICS + SABA, or ICS in addition to LABA or LAMA. Nine patients had a prescription with

**Table 3.** Reason for prescription and information on smoking habits.

Asthma*	Coughing	Dyspnoea	COPD based on clinical assumption	COPD after diagnostic spirometry	May be COPD	No reason noted
10	6	14	5	9	2	5

\*There was no information about how the asthma diagnosis was established.

**Table 4.** Smoking status at the time of registration.

Variables	Smokers at identification	Stopped smoking during R03-treatment or when Spirometry was performed	Non-smoker	X – smoker	No information found
Women	17	6	10	2	6
Men	2	1	3	1	2
Total	19	7	13	3	8

\*hma diagnosis was established.



**Table 5.** Treatment ordinated for the 49 pt.

Number of patients	Number of patients	Number of patients	Number of patients	Number of patients	Number of patients
Monotherapy (SABA)	LABA/LAMA	ICS as mono-therapy	ICS+ SABA	ICS+ LAMA or LABA	ICS+ LABA+LAMA (3-stof)
11	0	0	23	6	9

triple-therapy (ICS, LABA and LAMA), and only 9 patients actually had a specific COPD-diagnosis. There was no assessment of the seriousness of the condition. The treatment was not in consistency with the updated guidelines for treatment of patients with obstructive lung disease given from the national lifestyle project group in Nuuk. The reason for using treatment with ICS to the majority of the patients even without a specific diagnosis was not specified. This was done in spite of the risks of side effects such as pneumonia [23] and osteoporosis [24,25].

### Conclusion and Perspective

We found a prevalent of use of medications targeting obstructive lung disease (ATC-code R03) in patients aged  $\geq 50$  years of 7.4% in the period from 2011 to 2016 in the region of Upernavik Healthcare Center. This was comparable to studies covering the six biggest towns in Greenland from 2013 and 2016 [6,7]. Our study showed a lack of use of spirometry, as only 36% of patients with prescriptions of R03 medications have had a spirometry performed. Only 15 patients had a diagnostic spirometry performed and 9 patients with a FEV1/FVC  $< 0.70$  indicating COPD. There was a great discrepancy between guidelines and clinical practice. As found in other studies, R03 medications were prescribed to patients without a specific diagnosis, and without performing a spirometry. The findings indicate the existence of a large group of undiagnosed COPD patients. It was unclear how serious the patients respiratory symptoms were, and if they were given an optimal medical treatment and follow-up. The fact that 7 of 19 known smokers stopped smoking after they got the prescription on R03 medications indicates that there might have been some conversation about the importance of smoking cessation. The present study showed that the quality of identification, diagnosing and treatment of patients with possible COPD after 5 years of running a lifestyle project wasn't optimal. Therefore, a new strategy for identifying COPD patients had to be developed and implemented. This was taking place and had to run over a 4-year period from 1 January 2016 to 31 December 2019. This is described and evaluated in another study [26].

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