INTERNAL MEDICINE

Behavioral Changes in General Practitioners towards Chronic Obstructive Pulmonary Disease Over Five Years: An Observational Study

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Abstract

Objective Early detection of chronic obstructive pulmonary disease (COPD) is critical for preventing progression; however, the disease is rarely detected in the early stages. One reason for this is that COPD is not generally recognized and diagnosed by general practitioners (GPs). The objective of this study was to observe changes in the knowledge and behavior of GPs regarding the diagnosis and treatment of COPD over a five-year period.

Methods The surveys were performed using identical and anonymous questionnaires in 2005, 2006 and 2010. During this period, various educational campaigns were conducted.

Materials All members of the Shiga Medical Association working as GPs in Shiga Prefecture.

Results The number of questionnaires collected was 216 of 711, 269 of 731 and 326 of 856, respectively. Throughout the study period, the number of doctors who prescribed inhaled long-acting muscarinic antagonists (LAMAs) significantly increased (p<0.001). However, there were no significant changes in the rate of possession of spirometers or recognition of COPD guidelines. When we focused on the data for internists, the rate of recognition of the guidelines increased significantly (p<0.01), despite a lack of change in the rate of possession of spirometers. Furthermore, the results of the multivariate analysis revealed that increased knowledge concerning COPD was associated with the doctor's specialty, ownership of a spirometer, number of COPD patients attending their clinic and their level of recognition of the guidelines.

Conclusion During the study period, the GPs prescribed more inhaled LAMAs. The rate of recognition of COPD guidelines was also increased among internists. Educational campaigns may be more effective if the backgrounds of the GPs are taken into consideration.

Key words: chronic obstructive pulmonary disease (COPD), general practitioners (GPs), behavioral change, prescription, guidelines

Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic progressive condition largely attributed to the effects of cigarette smoking. Patients with COPD suffer slow declines in their pulmonary function, activities of daily living (ADLs) and quality of life (QOL). Murray et al. estimated that COPD will become the third most common cause of death, after ischemic heart and cerebrovascular disease, by

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2020 (1). In Japan, COPD was ranked as the ninth most common cause of death in 2011, and health care expenditures related to COPD are progressively increasing (2).

COPD is considered to be a preventable and treatable disease (3). Although early diagnosis and intervention are very important, the number of patients diagnosed and treated for COPD in Japan is quite low. According to a report from the Ministry of Health, Labour and Welfare of Japan in 2008, the number of COPD patients who received any type of treatment was estimated to be approximately 200,000 (2). On the other hand, an epidemiological survey conducted in 2004 revealed that 10.9% of Japanese individuals over 40 years of age have COPD, as defined by the presence of significant airflow limitations. Furthermore, Fukuchi et al. reported that the expected number of COPD patients in Japan is around 5.3 million, even excluding those with bronchial asthma (4).

Possible reasons for the large differences between these two reports are as follows: i) many people with COPD are asymptomatic and do not seek medical treatment and ii) general practitioners (GPs) may not diagnose such patients as having COPD. Performing spirometry following the inhalation of bronchodilator agents is essential for diagnosing COPD. However, the use of spirometry is insufficient in Japan as well as around the world (5).

In order to assess the behavioral change of GPs towards COPD, we conducted surveys to evaluate the behavior of GPs regarding the diagnosis and treatment of COPD over a five-year period from 2005 to 2010, during which time the Shiga Medical Association conducted a number of educational events designed to increase physician knowledge concerning COPD. During this period, the COPD guidelines proposed by the Japanese Respiratory Society (JRS) were revised in 2009 (6), the use of combination therapy consisting of an inhaled corticosteroid and long-acting β2 agonist (ICS/LABA) for the treatment of COPD was approved by the Ministry of Health, Labour and Welfare of Japan in 2009 and the COPD guidelines issued by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) were revised in 2006 (7).

Materials and Methods

Educational campaigns

Between April 2005 and April 2010, the Shiga COPD research group performed various educational campaigns throughout Shiga Prefecture in cooperation with the Shiga Medical Association. Shiga Prefecture has a population of approximately 1.38 million encompassing 4,000 km^2 and is located in the center of Honshu Island, the largest island in Japan. The campaigns were targeted at GPs who worked in Shiga Prefecture and included repeated educational lectures regarding the diagnosis and treatment of COPD, seminars concerning smoking cessation and practical training with respect to the use of spirometers.

Data collection

In order to test whether the GPs' knowledge about the diagnosis and treatment of COPD changed during the study period, three surveys were conducted over five years in July 2005, November 2006 and April 2010. The three surveys were identical, and the questions covered the following items: 1) the location of the physician's clinic, 2) the physician's specialty (if any), 3) the physician's age, 4) whether the physician possessed a spirometer and, if not, 5) why not. Additional questions included 6) factors taken into account in making the diagnosis of COPD, 7) the number of COPD patients treated at their clinic, 8) their choice of therapeutic agents for patients with a diagnosis of COPD and 9) their level of recognition of the COPD guidelines. (Multiple answers were allowed for some of the questions). The actual questions are listed in the Appendix. All surveys were conducted in cooperation with Shiga Medical Association. The questionnaires were sent to all members of Shiga Medical Association via fax, and anonymous response sheets were received by fax or mail at the Shiga Medical Association office. Members of the association represent almost 100% of GPs in the prefecture. Informed consent was obtained from all respondents, and the study protocol was approved by the ethics committee of Shiga University of Medical Science.

Data analysis

All statistical analyses were performed using the JMP 9 software program (SAS Institute, Cary, USA). Differences between groups were evaluated using Pearson's chi-squared test. Multivariate regression analyses were performed to evaluate the relative contribution of the physician's specialty to their level of recognition of the guidelines and prescription of long-acting muscarinic antagonists (LAMAs). A p value of less than 0.05 was considered to be statistically significant.

Results

Response rates and background characteristics of the respondents

The number of returned questionnaires was 216 of 711 in 2005, 269 of 731 in 2006 and 326 of 856 in 2010, for response rates of 30.4%, 36.8% and 38.1%, respectively. The response rate for the first survey was significantly lower than that for the second (p<0.01) and third (p<0.01) surveys. Among the respondents, the number of GPs who were internists was 148 (68.5%), 166 (61.7%) and 231 (70.9%), respectively. There were no differences in the location of the clinics or the physicians' specialty or age between the three surveys.

Questions related to the diagnosis and treatment of COPD

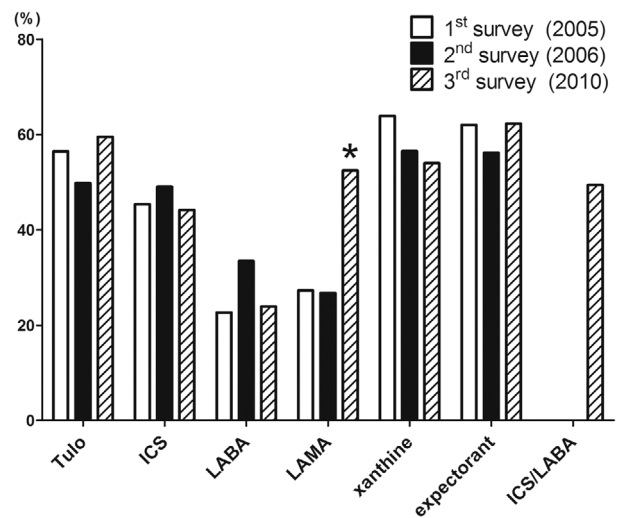The number of respondents who possessed a spirometer
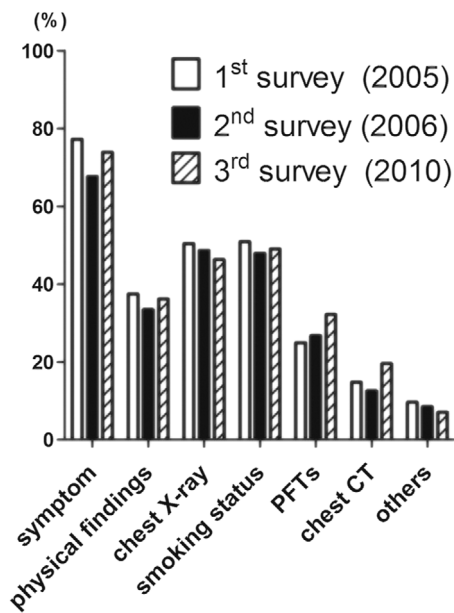
Figure 1. Answers to the question about important factors for diagnosing COPD in the first (white column), second (black column) and third (striped column) surveys. Multiple answers were allowed for this question. The data are expressed as percentages. There was a tendency for an increasing number of respondents to consider pulmonary function tests to be important, although this change over time was not statistically significant (first survey versus third survey, p=0.07).
CT: computed tomography, PFTs: pulmonary function tests

Figure 2. Answers to the question about medications for the treatment of COPD in the first (white column), second (black column) and third (striped column) surveys. Multiple answers were allowed for this question. The data are expressed as percentages. The number of respondents who selected inhaled long-acting muscarinic antagonists (LAMAs) was 59 (27.3%), 72 (26.8%) and 171 (52.5%), respectively. *: There was a significant difference between the first and third surveys (p<0.001) and between the second and third surveys (p<0.001) (Pearson's chi-squared test). (Data for ICS/LABA were not collected at the first and second surveys because this treatment had not been approved for COPD by the Ministry of Health, Labour and Welfare of Japan at that time).
expectorant: expectorant drugs, ICS: inhaled corticosteroids, LABA: long-acting β2 agonists, LAMA: long-acting muscarinic antagonists, Tulo: transdermal β2 stimulants (tulobuterol), xanthine: oral xanthine drugs

was 83 (38.6%), 102 (38.2%) and 138 (42.3%) for the 2005, 2006 and 2010 surveys, respectively. Although there was a tendency toward an increasing response rate, there were no significant differences between the three surveys. The most frequently reported reason why the GPs did not have a spirometer was "I do not need it" throughout the three surveys. Regarding the question about the factors taken into account for the diagnosis of COPD (multiple answers were allowed), there was a tendency toward an increase in the number of respondents who considered pulmonary function tests to be important, at 54 (25.0%), 72 (26.8%) and 105 (32.2%), respectively, although this change was not statistically significant. On the other hand, more respondents considered symptoms, physical findings, features on chest X-rays and the smoking status to be important on all surveys (Fig. 1). With respect to the question about the number of COPD patients in the GPs' clinics, more than half of the respondents answered that they treated five patients or less at each survey.

As to the question about medications for COPD (multiple answers were allowed), the majority of respondents prescribed expectorants, oral xanthine drugs and transdermal β2 agonists at each survey. The number of respondents who selected inhaled LAMAs was 59 (27.3%), 72 (26.8%) and 171 (52.5%), respectively; there was a significant difference between the first and third surveys (p<0.001) and between the second and third surveys (p<0.001). In January 2009, the use of combination therapy consisting of an ICS/LABA was approved for the treatment of COPD by the Ministry of

Health, Labour and Welfare of Japan. In the third survey conducted after approval, the number of respondents who prescribed ICS/LABA for COPD was 161 (49.4%) (Fig. 2).

Regarding the question about the guidelines, the number of respondents who were aware of at least one of the guidelines, those published by the JRS or GOLD, was 170 (78.7%), 209 (77.7%) and 273 (83.7%) for the 2005, 2006 and 2010 surveys, respectively, with no significant differences between the surveys.

Subanalysis: answers from internists only

In Japan, any doctor may function as a GP, and some GPs specialize in specific fields, such as dermatology, orthopedics or otorhinolaryngology. Since we hypothesized that COPD patients would primarily be examined by internists, including those with a specific specialty (e.g., gastroenterology, endocrinology) functioning as GPs, we focused on the data for internists.

The number of internists who possessed a spirometer was 69 (46.6%), 85 (51.5%) and 120 (52.2%) for the 2005, 2006 and 2010 surveys, respectively, and, although these rates were significantly higher than those observed in the entire

Table 1. Multivariate Regression Analysis of Factors Associated with the Rate of Recognition of the Guidelines in the Third Survey (n=326).

Variables	Odds ratio	95% CI	p value
Specialty			
internists	7.3	3.4-10.9	<0.0001
non-internists	Reference		
Possession of spirometer			
owner	2.7	1.0-8.4	0.06
non-owner	Reference		
The number of COPD patients at the clinic			
>5	12.9	2.5-238.2	<0.005
≤5	Reference		

95% CI: 95% confidence interval

Table 2. Multivariate Regression Analysis of Factors Associated with the Rate of Prescription of Inhaled-LAMAs in the Third Survey (n=326).

Variables	Odds ratio	95% CI	p value
Specialty			
internists	2.9	1.5-5.8	<0.005
non-internists	Reference		
Possession of spirometer			
owner	2.3	1.3-4.0	<0.01
non-owner	Reference		
The number of COPD patients at the clinic			
>5	2.3	1.3-4.3	<0.05
≤5	Reference		
Recognition of guidelines			
yes	12.4	3.5-79.2	<0.0001
no	Reference		

95% CI: 95% confidence interval

study group, there were no significant differences between the surveys. As to the question regarding factors taken into account for diagnosis and treatment, the internists placed great value on symptoms, the smoking status and chest X-ray findings; however, there was a trend over the five-year period in which they considered pulmonary function tests to be increasingly important: 41 (27.7%), 61 (36.6%) and 90 (39.0%) for the 2005, 2006 and 2010 surveys, respectively. However, there were no significant differences between the surveys. On the other hand, the number of internists who were aware of at least one of the COPD guidelines was 121 (81.8%), 155 (93.4%) and 217 (93.9%) for the 2005, 2006 and 2010 surveys, respectively, with significant differences between the first and second surveys (p<0.01) and between the first and third surveys (p=0.001).

Multivariate analysis to clarify factors associated with knowledge of the guidelines

Since knowledge of the guidelines increased over time, we performed a multivariate analysis using the data obtained from the third survey (n=326) in order to clarify factors associated with this knowledge. Consequently, the GP's specialty, possession of a spirometer and number of COPD patients in their clinic were set as potentially explanatory variables, with knowledge of the guidelines as the outcome variable. As shown in Table 1, only the GP's specialty (internist versus non-internist) (Odds Ratio 7.3, 95% C.I. 3.4-10.9, p< 0.0001) and number of COPD patients followed by the GP (Odds Ratio 12.9, 95% C.I. 2.5-238.2, p<0.005) were found to be associated with the rate of recognition of the guidelines.

Multivariate analysis to clarify factors associated with the rate of prescription of inhaled LAMAs

Since the rate of prescription of inhaled LAMAs increased significantly over the three surveys, we performed a multivariate analysis using the data obtained from the third survey (n=326) in order to clarify factors associated with this change. As a result, the GP's specialty, possession of a spirometer, number of COPD patients in their clinic and knowledge of the guidelines were set as explanatory vari-

ables, and the rate of prescription of inhaled LAMAs was the outcome variable. As shown in Table 2, the GP's specialty (internist versus non-internist) (Odds Ratio 2.9, 95% C.I. 1.5-5.8, p<0.005), possession of a spirometer (Odds Ratio 2.3, 95% C.I. 1.3-4.0, p<0.01), number of COPD patients (Odds Ratio 2.3, 95% C.I. 1.3-4.3, p<0.05) and recognition of the guidelines (Odds Ratio 12.4, 95% C.I. 3.5-79.2, p<0.0001) were each identified to be independently associated with the prescription of inhaled LAMAs.

Discussion

This study was an observational study conducted to clarify how the behavior of GPs toward the diagnosis and treatment of COPD changed over a five-year period in Japan, specifically within Shiga Prefecture. Although the percentage of GPs who possessed a spirometer did not increase, more GPs prescribed inhaled LAMAs, the currently recommended first-line drugs for COPD. When we focused on the internists, knowledge concerning guidelines for COPD increased significantly between the surveys. The results of the multivariate analysis revealed that increased knowledge concerning COPD was influenced by the GP's specialty (internist or non-internist), ownership of a spirometer, number of COPD patients attending their clinic and their level of recognition of the guidelines.

We anticipated that knowledge of COPD may have increased over the period of the surveys for the following reasons: 1) the high profile GOLD guidelines for the management of COPD were revised in 2006/2007 (7), 2) the Revised JRS guidelines for COPD were published in 2009 (6), 3) inhaled LAMA treatment and smoking cessation therapy were approved for the treatment of COPD by the Ministry of Health, Labour and Welfare of Japan in 2004, 4) ICS/LABA combination therapy was approved for use in patients with COPD in 2009 and 5) a series of educational activities designed to increase physicians' knowledge about the diagnosis and treatment of COPD were conducted by both the pharmaceutical industry and various medical associations.

These sessions provided several opportunities for GPs to learn more about the diagnosis and management of COPD. Our results suggest that these factors may have contributed to the use of particular medications to treat COPD, although they did not result in an increased rate of use of spirometry to diagnose COPD.

Although the percentage of respondents who owned a spirometer increased to more than 40% by the third survey, this change was not statistically significant. Moreover, few GPs considered spirometry to be important for obtaining a diagnosis of COPD. This observation suggests that the GPs did not use their spirometers. Although we do not have any data regarding the actual rate of use of spirometers, Miravitlles et al. reported that approximately 40% of patients with COPD do not undergo spirometry and are diagnosed based on their clinical symptoms. Furthermore, the authors also reported that spirometric results not considered to be plausible were observed in approximately 43% of cases, while the proportion of examinations completed using bronchodilator tests was only 32% (5). Possible reasons why the GPs did not use their spirometers include: 1) performing spirometry takes too much time, 2) the GPs may not be proficient in using spirometry and/or 3) they may not feel confident in interpreting the results.

The number of GPs who considered pulmonary function tests to be important for obtaining a diagnosis of COPD increased slightly between the surveys; however, this change was not statistically significant. As previously reported, the majority of the GPs considered non-specific findings, such as symptoms, physical examination data, chest X-ray abnormalities and/or the smoking status to be important for diagnosing COPD (8). Previously, COPD was a relatively non-specific term applied to individuals exhibiting either chronic bronchitis or emphysema. The former is diagnosed based on symptoms, while the latter is based on pathological findings. In contrast, COPD is now defined according to the results of spirometry. As we previously reported, person to person interactions are necessary to change the awareness and behavior of GPs (9).

It has been reported that the rate of diagnosis of COPD by GPs remains low worldwide (10). Although pulmonary function tests are necessary to detect COPD in the early stages, the rate of ownership of spirometers did not change during the observation period in the present study. In other jurisdictions, several screening strategies have been developed to identify individuals with early-stage COPD. The International Primary Care Airway Group (IPAG) developed a simple patient self-administered questionnaire that can be used to identify patients with a high likelihood of having COPD, for whom spirometric testing is particularly important (11). Implementation of this questionnaire has been used in a number of countries to increase the frequency of detection of undiagnosed COPD. The initial application of IPAG screening surveys followed by more detailed examinations, including pulmonary function tests conducted by respiratory specialists, is one strategy that has met with success (12, 13).

The results of the current multivariate analysis showed that the internists who possessed a spirometer, treated many COPD patients at their clinic and were aware of the guidelines for COPD tended to prescribe inhaled LAMAs. Moreover, our findings showed that the internists and those who treated many COPD patients at their clinic tended to be aware of the guidelines for COPD. These results indicate that the backgrounds of GPs should be taken into account when conducting educational campaigns.

This study is associated with several limitations. First, the respondents were not the same in every survey. Therefore, we could not assess behavioral changes in specific persons. However, we sent three surveys to all members of the Shiga Medical Association and the characteristics of respondents were similar between the surveys. Second, the response rates of three surveys were not high. Therefore, it is necessary to consider the possibility that GPs active in COPD treatment tended to respond to the questionnaires. As the response rates for the second and third surveys were significantly higher than that for the first survey, this may be a source of bias. Hence, our results are not generalizable to the entire GP population. Third, we do not know which or how many of the respondents attended the educational events offered over the period of observation. Finally, we were only able to perform surveys three times during the observation period, not annually.

In summary, we herein conducted surveys using questionnaire to assess behavioral changes in GPs towards COPD. At the end of the observation period, more GPs prescribed inhaled LAMAs and the rate of recognition of COPD guidelines increased among the internists. Educational campaigns may be more effective if the backgrounds of the GPs are taken into consideration.

Appendix

The questions asked at each survey were as follows:

Q1   Tell us about your background.

     Specialty: Internist / Surgeon / Others

     Age: 20s / 30s/ 40s / 50s / 60s / 70s / 80s and more

     Smoking Habits: current smoker / former smoker / never smoker

Q2   Tell us about smoking in your clinic.

     totally banned / partially banned / smoking allowed

Q3   How many patients do you instruct about smoking cessation?

     _____ patients

Q4   Do you know that there is a management fee for nico-

tine dependence?

Yes. / No. / I have heard of it.

Q5   Are you charging this fee?

Yes, I charge it. / It is under consideration. / I don't charge it.

Others (   )

Q6   If you don't charge the fee, why?

My clinic doesn't meet the facility criteria. / I don't know about the fee. / I'm not interested in it. / Others

(   )

Q7   Do you own a spirometer?

Yes / No

Q8   Do you own an electrocardiograph?

Yes / No

Q9   If you own a spirometer, how often do you use it?

I often use it. / I use it sometimes. / I don't use it.

Q10 If you don't own a spirometer, why?

I don't need it. / Too busy to use it. / It's too bothering. / I don't know how to use it. / It doesn't pay. / other reason (   )

Q11 Which factors do you take into account for the diagnosis of COPD? (multiple answers allowed)

Symptom / physical findings / chest X-ray / smoking status / result of spirometer / result of computed tomography / Others (   )

Q12 How many patients with COPD are you managing?

_____ patients

Q13 Score your management of these patients. (1: poorly managed - 5: well managed)

1 / 2 / 3 / 4 / 5

Q14 Select the drugs you usually use for treatment of COPD. (multiple answers allowed)

Inhaled Drugs

ICS&LABA / LABA / SABA / LAMA / SAMA / ICS

Transdermal Drugs

β2-agonist

Oral Drugs

xanthine drugs / β2-agonist / corticosteroids / expectorant drugs / expectorant drugs / antitussive drugs / antibiotics

Others

Long term oxygen therapy (LTOT) / others (   )

Q15 Do you know about guidelines for COPD?

Yes, I know. / I have heard of it. / No , I don't.

Q15-1 If you know the guideline for COPD, which one do you know? (multiple answers allowed)

JRS 2004 / JRS 2009 / GOLD 2003 / GOLD 2009 / others (   )

Q15-2 If you don't know about the guidelines for COPD, are you interested in knowing?

I want to know. / I'm not interested in it. / others (   )

Q16 Tell us about the area you work at.

Otsu / Kusatsu / Moriyama / Yasu / Ritto / Takashima / Koka / Konan / Gamou / Oumi-Hachiman / Hikone / Higashi-Omi / Echi / Inukami / Nagahama / Maibara

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