Clinical Outcomes of Multidisciplinary Care in Chronic Obstructive Pulmonary Disease Patients at the Central Chest Institute of Thailand

Kanlaya Panjapornpon MD*,
Sonklin Tanont BNS**

* Department of Pulmonary Medicine, Central Chest Institute of Thailand, Nonthaburi, Thailand
** Department of Outpatient Nursing, Central Chest Institute of Thailand, Nonthaburi, Thailand

Objective: To compare clinical outcomes before and after are enrolled study within 1 year and factors related to Chronic Obstructive Pulmonary Disease (COPD) exacerbations after enrolled.

Material and Method: COPD patients who were compatible with inclusion criteria in COPD clinic at the Central Chest Institute of Thailand between March 2007 and July 2010. Baseline characteristics, COPD management program, bronchodilator used, and clinical outcomes were recorded by a search of retrospective databases, as well as the patient medical records.

Results: A total of 247 enrolled patients compatible with inclusion criteria were analyzed. Most of the patients were male, 240 patients (97.2%). The average age of the patients was 69.3 ± 9.1 years. The majority of patients were in GOLD stage II, 121 patients (49.0%). After multidisciplinary care was performed. In an overall 219 patients (88.6%) of COPD patients received appropriate bronchodilator treatment classified by GOLD stage which had different proportions in each stage significantly [stage I = 45 patients (100%), stage II = 103 patients (86.6%), stage III = 58 patients (86.6%), stage IV = 13 patients (92.8%), p = 0.026]. COPD exacerbations frequency (0.9 ± 1.6 vs. 0.3 ± 0.9, p < 0.001), COPD related-hospitalizations (0.2 ± 0.8 vs. 0.1 ± 0.4, p < 0.001), COPD related-respiratory failure (0.04 ± 0.25 vs. 0.008 ± 0.090, p = 0.020) were significantly decreased after enrolled. On multivariate analysis, COPD patients who had exacerbations frequency more than one time per year were prone to have repeated COPD exacerbations approximately three times more than other COPD patients (Adjusted Odds ratio 2.80, 95% CI, 1.08 to 7.26, p = 0.034).

Conclusion: Multidisciplinary care in COPD patients can significantly improve clinical outcomes.

Keywords: Multidisciplinary care, COPD, Clinical outcomes, Exacerbations

Chronic Obstructive Pulmonary Disease (COPD), a common disease characterized by airflow limitation that is not fully reversible, is predicted to be the third most frequent cause of death in the world by 2020[1]. COPD is a preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in individual patients. Cardiovascular, musculoskeletal, metabolic and mental comorbidities are considered to be part of the frequently prevalence extrapulmonary sequelae of the disease. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) has provided evidenced-based management guideline for COPD which advocate staging COPD by spirometry and make specific treatment recommendations base on COPD stage[2].

The National Emphysema Treatment Trial (NETT) used a multidisciplinary team approach to implement the maximum medical care protocol, including adjustment of medications and out patient pulmonary rehabilitation for all patients and nutritional and psychological counseling as needed[3].

Patients with frequent exacerbations have increased induced sputum cytokine interleukin (IL)-6 and IL-8 levels when stable[4]. Exacerbations appear to accelerate the decline in lung function that characterizes COPD, resulting in reduced physical activity, poorer quality of life, increased risk of death and they are also responsible for a large proportion of the health care costs attributable to this prevalent condition[5]. Exacerbations of COPD are a major cause of morbidity and mortality and hospital admission[6]. Exacerbations are now recognized as an important outcome measure

Correspondence to:
Panjapornpon K, Department of Pulmonay Medicine, Central Chest Institute of Thailand, Tiwanond Road, Nonthaburi 11000, Thailand.
Phone: 0-2580-3423, Fax: 0-2592-9252
E-mail: kpanjapornpon@yahoo.com

in COPD. In the last 10 years frequent exacerbations have been shown to be associated with poorer health outcomes and a greater burden on the health service[7]. The single best predictor of exacerbations, across all GOLD stage, was a history of exacerbations[8].

At the Chest Institute of Thailand (CCIT), COPD is one of the most common diseases of out-patient and in-patient service which have high morbidity and mortality. COPD Clinic was setting in March 2007 from multidisciplinary care team for COPD patients in a benefit to improve clinical outcomes[9].

Hypothesis

Multidisciplinary care in COPD patients would be benefit for patient care to improve clinical outcomes in COPD exacerbations frequency, hospitalization and respiratory failure.

Objective

1) Primary outcome: To compare COPD exacerbations frequency before and after enrolled study within 1 year.

2) Secondary outcome: To compare COPD related-hospitalizations and respiratory failure before and after enrolled study within 1 year and evaluate factors related to COPD exacerbations after enrolled.

Material and Method

Ethics Committees at CCIT approved the present study.

Study type

Retrospective cohort study.

Study population

COPD patients in COPD Clinic at CCIT between March 2007 and July 2010. Patients were eligible for inclusion in the present study if: 1) A diagnosis of COPD in any patient who has dyspnea, chronic cough or sputum production. 2) A ratio of forced expiratory volume in 1 second (FEV1) to forced vital capacity (FVC) of 0.7 or less, after bronchodilator use and any FEV1, after bronchodilator used by spirometry. 3) Chest radiographs show no pulmonary infiltrate. 4) Current or ex-smoker with history of smoking equivalent to 10 or more pack-years. 5) Aged 40 years or older. 6) 1 year follow-up before and after enrolled.

Study intervention

Multidisciplinary care of COPD clinic

including: 1) Registration of COPD patients who met the inclusion criteria were selected. 2) Patient educations included smoking cessation. 3) Pharmaco-logical treatment and advice of proper inhaler technique. 4) Influenza vaccination. 5) Pulmonary rehabilitation. 6) Nutritional education in COPD patients whom Body Mass Index (BMI) < 21 kg/m². 7) Long term oxygen therapy (LTOT) for patients with Stage IV whom indicate.

Data will be collected

Data regarding baseline characteristics, Pulmonary function test (PFT)[10], Modified Medical Research Council dyspnea scale (MMRC)[11], six-minute Walk Test[12] COPD management program, broncho-dilator used and clinical outcomes: COPD exacer-bations, COPD related-hospitalizations and COPD related-respiratory failure were recorded as times per year by a search of retrospective databases, as well as the patient medical records.

Term definition

Stage of COPD defined by GOLD classification[2], The BODE index[13] takes into account: body mass index (B), airflow obstruction (O) as assessed on the basis of FEV1, dyspnea (D) as measured with the Modified Medical Research Council (MMRC) dyspnea scale and exercise capacity (E) as measured by the six-minute walk test. The total possible values range from 0 to 10 of which higher scores indicate a high risk of death. Categorizing the BODE scores into 4 quartiles by quartile 1 is a score of 0 to 2, quartile 2 is a score of 3 to 4, quartile 3 is a score of 5 to 6 and quartile 4 is a score of 7 to 10. An Exacerbation of COPD[8,14] is defined by a change in the patient's baseline dyspnea, cough and/or sputum that is beyond normal day to day variations, is acute onset and events that led a care provider to prescribe antibiotics or oral corticosteroids with or without hospitalization.

Statistical analysis

The categorical data was presented as frequency and percentage and the continuous data were presented as mean $\pm$ SD. Comparison of categorical data between groups using Fisher's exact probability test and continuous data using paired t-test. Risk factors of COPD exacerbations using multivariate logistic regression analysis and measured by odds ratios with 95% confidence intervals. The probability level for statistical significance was established at $p < 0.050$. All statistics were performed by using Stata version 11.0.

Results

A total of 247 enrolled patients compatible with inclusion criteria were analyzed. Most of the patients were male, 240 patients (97.2%). The average age of patients was 69.3 ± 9.1years. There were 121 patients with GOLD stage II (49.0%). The most patients with co-morbidity were hypertension as 56 of 133 patients (42.1%). The baseline characteristics of the patients are shown in Table 1. Multidisciplinary care was performed which included: 1) 246 patients of disease educations (99.6%), 2) 246 patients of smoking cessation educations (99.6%), 224 patients of quit smoking before enrolled (90.6%), 17 patients of quit smoking by behavior therapy (77.3%), 5 patients who could not quit smoking (22.7%). 3) 241 patients were advised proper inhaler technique (97.6%). 4) 239 patients were given influenza vaccine (96.2%). 5) 240 patients were advised home based pulmonary rehabilitation (97.2%). 6) 97 of 108 patients were advised nutritional education in COPD patients whom BMI < 21 kg/m² (89.8%). 7) 12 patients of LTOT education for patients with GOLD stage IV whom indicate (85.7%), 5 patients (41.6%) really used. In an overall 219 patients (88.6%) of COPD patients received appropriated bronchodilator treatment classified by GOLD stage which had different proportion in each stage significantly [stage I = 45 patients (100%), stage II = 103 patients (86.6%), stage III = 58 patients (86.6%), stage IV = 13 patients (92.8%), p = 0.026]. Comparison of clinical outcomes in COPD patients before and after enrolled study within 1 year are shown in Table 2. COPD exacerbations frequency was significantly decreased after enrolled in all GOLD stage, BODE quartile 1, 2 and 3. COPD related-hospitalizations was significantly decreased after enrolled in GOLD stage II (0.2 ± 0.8 vs. 0.1 ± 0.4, p = 0.002), BODE quartile 1 (0.1 ± 0.4 vs. 0.04 ± 0.32, p = 0.033) and BODE quartile 2 (0.4 ± 0.8 vs. 0.1 ± 0.4, p = 0.006). COPD related-respiratory failure was significantly decreased after enrolled (0.04 ± 0.25 vs. 0.008 ± 0.090, p = 0.020). After adjusting for BODE quartile 4, Respiratory failure, Exacerbations frequency more than 1 time per year and GOLD stage IV, COPD patients who had exacerbations frequency more than one time per year before enrolled was significant factor in relation to COPD exacerbations after enrolled (Adjusted Odds ratio 2.80, 95% CI 1.08 to 7.26, p = 0.034). Multivariate logistic regression model for factors related to COPD exacerbations after enrolled are shown in Table 3.

Discussion

The BODE index, a simple multidimensional grading system, is better than the FEV1 at predicting the risk of death from any cause and respiratory that is caused among patients with COPD[13]. The National

Table 1. Baseline Characteristics in 247 patients with COPD

Baseline Characteristics	All patients (n = 247)
Gender: male, n (%)	240 (97.2)
Age (years), (mean ± SD)	69.3 ± 9.1
Co-morbidities, n (%)	
0	114 (46.2)
1	91 (36.8)
≥ 2	42 (17.0)
History of smoking, (pack-years), (mean ± SD)	42.8 ± 35.0
BMI, (kg/m2), (mean ± SD)	21.7 ± 3.6
FEV1, (% predicted), (mean ± SD)	61.1 ± 22.4
MMRC dyspnea scale, (mean ± SD)	1.6 ± 1.1
Six-minute walk test, meters, (mean ± SD)	340 ± 2.2
GOLD classification, n (%)	
Stage I	45 (18.2)
Stage II	121 (49.0)
Stage III	67 (27.1)
Stage IV	14 (5.7)
BODE index, (mean ± SD)	2.9 ± 2.2

BMI, body mass index; FEV1, forced expiratory volume in 1 second; MMRC, modified medical research council dyspnea scale

Table 2. Comparison of clinical outcomes in COPD patients before and after enrolled study within 1 year

Clinical outcomes, (times per year)	before enrolled	After enrolled	p-value
COPD exacerbations	0.9 ± 1.6	0.3 ± 0.9	< 0.001*
GOLD stage I	0.9 ± 2.2	0.4 ± 1.3	0.006*
GOLD stage II	0.9 ± 1.6	0.2 ± 0.7	< 0.001*
GOLD stage III	0.8 ± 1.4	0.4 ± 0.8	0.002*
GOLD stage IV	1.4 ± 1.6	0.6 ± 1.2	0.006*
BODE quartile 1	0.7 ± 1.2	0.2 ± 0.6	< 0.001*
BODE quartile 2	1.2 ± 1.8	0.4 ± 0.8	< 0.001*
BODE quartile 3	0.9 ± 1.6	0.4 ± 1.0	0.011*
BODE quartile 4	0.6 ± 0.8	0.4 ± 0.7	0.337
COPD related-hospitalizations	0.2 ± 0.8	0.1 ± 0.4	< 0.001*
GOLD stage I	0.2 ± 1.2	0.1 ± 0.6	0.256
GOLD stage II	0.2 ± 0.8	0.1 ± 0.4	0.002*
GOLD stage III	0.2 ± 0.5	0.1 ± 0.4	0.163
GOLD stage IV	0.6 ± 0.7	0.2 ± 0.4	0.096
BODE quartile 1	0.1 ± 0.4	0.04 ± 0.32	0.033*
BODE quartile 2	0.4 ± 0.8	0.1 ± 0.4	0.006*
BODE quartile 3	0.2 ± 0.5	0.2 ± 0.6	0.572
BODE quartile 4	0.4 ± 0.5	0.2 ± 0.4	0.082
COPD related-respiratory failure	0.04 ± 0.25	0.008 ± 0.090	0.020*
GOLD stage I	0.08 ± 0.46	0.02 ± 0.14	0.182
GOLD stage II	0.02 ± 0.12	0.0 ± 0.0	0.158
GOLD stage III	0.03 ± 0.17	0.01 ± 0.12	0.567
GOLD stage IV	0.1 ± 0.3	0.0 ± 0.0	0.164
BODE quartile 1	0.01 ± 0.10	0.0 ± 0.0	0.320
BODE quartile 2	0.04 ± 0.20	0.0 ± 0.0	0.083
BODE quartile 3	0.0 ± 0.0	0.03 ± 0.18	0.325
BODE quartile 4	0.08 ± 0.28	0.0 ± 0.0	0.337

Table 3. Multivariate logistic regression model for factors related to COPD exacerbations

Factors	Adjusted Odds ratio	95% CI	p-value
BODE quartile 4	4.50	(0.45-44.70)	0.199
Respiratory failure	3.25	(0.42-25.44)	0.261
Exacerbations frequency more than 1 time per year	2.80	(1.08-7.26)	0.034*
GOLD stage IV	1.05	(0.08-12.40)	0.968

Emphysema Treatment Trial (NETT) used a multidisciplinary team approach to implement the maximum medical care protocol, including adjustment of medications and out patient pulmonary rehabilitation for all patients and nutritional and psychological counseling as needed. Regular assessment of the patient and communication between team members is vital as the management of the patient with COPD[3]. The future of exacerbation prevention is in assessment of optimum combination of pharmacological and non-pharmacological therapies that will result in improvement of health status, and reduction of hospital admission and mortality associated with COPD[15]. The COPD Disease Specific Care Management Program at National Jewish Medical and Research Center has demonstrated statistically significant decreases in Emergency Department (ED) visits, hospitalizations and intensive care unit admissions[16]. Bourbeau et al showed that patients with COPD who received educational interventions with supervision and support based in disease-specific self-management principles had improved outcomes and less hospital, emergency room and urgent physician visits compared with control (usual care) group[17].

At CCIT, COPD is one of the most common diseases of out-patient and in-patient service which have high morbidity and mortality. COPD Clinic was setting from multidisciplinary care team for COPD patients. The present study found that there was a significant decrease COPD exacerbations frequency $(0.9 \pm 1.6$ vs. 0.3 ± 0.9, p < 0.001), COPD related-hospitalizations $(0.2 \pm 0.8$ vs. 0.1 ± 0.4, p < 0.001), COPD related-respiratory failure $(0.04 \pm 0.25$ vs. 0.008 ± 0.090, p = 0.020) after enrolled.

A group of British investigators has showed a relationship between airway inflammations and the frequency of exacerbations in patients with COPD. Patients with frequent exacerbations have an increased bacterial load in their airways in stable state. This lower airway bacterial load is associated with increased airway inflammation and accelerated decrease in FEV1, an indirect but potent mortality indicator[18,19]. Hurst JR et al studied 2,138 patients in the Evaluation of COPD Longitudinally to identify Predictive Surrogate Endpoints (ECLIPSE) over a period of 3 years. Results of the present study, Exacerbations became more frequent (and more severe) as the severity of COPD increased; exacerbation rates in the first year of follow-up were 0.85 per person for patients with stage 2 COPD, 1.34 for patients with stage 3 and 2.00 for patients with stage 4. Overall, 22% of patients with stage 2 disease, 33% with stage 3 and 47% with stage 4 had frequent exacerbations (two or more in the first year of follow-up)[8]. Multivariate logistic regression model analyze the prognostic influence of acute exacerbations of COPD treated in hospital in a prospective cohort of 304 men with COPD followed-up for 5 years showed that older age (Hazard ratio (HR) 5.28, 95% CI 1.75 to 15.93), arterial carbon dioxide tension (HR 1.07, 95% CI 1.02 to 1.12) and acute exacerbations of COPD were found to be independent indicators of a poor prognosis. Hurst et al showed that the single best predictor of exacerbations, across all GOLD stage, was a history of exacerbations[8]. The patients with the greatest mortality risk were those with three or more acute COPD exacerbations (HR 4.13, 95% CI 1.80 to 9.41)[6]. A multiple logistic regression analysis found that forced expiratory volume in 1 second (FEV1) impairment, chronic mucus hypersecretion, increase of age and presence of significant comorbidity are significantly associated with the risk of frequent exacerbations[20].

The present study on multivariate analysis, exacerbations frequency more than one time per year before enrolled was a significant factor in relation to COPD exacerbations after enrolled (Adjusted Odds ratio 2.80, 95% CI 1.08 to 7.26, p = 0.034).

Conclusion

Multidisciplinary care in COPD patients can significantly improve clinical outcomes in COPD exacerbations frequency, hospitalization and respiratory failure. COPD patients who had exacerbations frequency more than one time per year would be prone to have repeated COPD exacerbations approximately three times more than other COPD patients.

Potential conflict of interest

None.

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ผลการศึกษาทางคลินิกของการดูแลผู้ป่วยโรคปอดอุดกั้นเรื้อรังโดยสหสาขาวิชาชีพสถาบันโรคทรวงอก

กัลยา ปัญจพรผล, ซ่อนกลิ่น ทานนท์

วัตถุประสงค์*: เพื่อเปรียบเทียบผลการศึกษาทางคลินิก ก่อนและหลังเข้าการศึกษาในระยะเวลา 1 ปี และปัจจัยที่สัมพันธ์กับการกำเริบของโรคปอดอุดกั้นเรื้อรังหลังเข้าการศึกษา*

วัสดุและวิธีการ*: ผู้ป่วยโรคปอดอุดกั้นเรื้อรังที่เข้าได้กับเกณฑ์คัดอาสาสมัครเข้า ในคลินิกโรคปอดอุดกั้นเรื้อรัง สถาบันโรคทรวงอก ตั้งแต่เดือนมีนาคม พ.ศ. 2550 ถึงเดือนกรกฎาคม พ.ศ. 2553 ข้อมูลพื้นฐานทางคลินิก การดูแลผู้ป่วยโดยสหสาขาวิชาชีพ การใช้ยา ผลการศึกษาทางคลินิก บันทึกจากเวชระเบียนโดยการศึกษาย้อนหลัง*

ผลการศึกษา*: ผู้ป่วยทั้งหมด 247 คน ที่เข้าได้กับเกณฑ์คัดอาสาสมัครเข้าและนำมาวิเคราะห์ส่วนใหญ่เป็นเพศชาย 240 คน (ร้อยละ 97.2) อายุเฉลี่ย 69.3 ± 9.1 ปี ส่วนใหญ่เป็นโรคปอดอุดกั้นเรื้อรังระยะที่ 2 จำนวน 121 คน (ร้อยละ 49.0) ได้รับการดูแลโดยสหสาขาวิชาชีพ ผู้ป่วย 219 คน (ร้อยละ 88.6) ได้รับการรักษาด้วยยาขยายหลอดลมอย่างเหมาะสมตามระยะของโรคซึ่งมีสัดส่วนที่แตกต่างกันในแต่ละระยะอย่างมีนัยสำคัญ (ระยะที่ 1 จำนวน 45 คน คิดเป็นร้อยละ 100, ระยะที่ 2 จำนวน 103 คนคิดเป็นร้อยละ 86.6, ระยะที่ 3 จำนวน 58 คน คิดเป็นร้อยละ 86.6, ระยะที่ 4 จำนวน 13 คน คิดเป็นร้อยละ 92.8, p = 0.026). อัตราการกำเริบของโรคปอดอุดกั้นเรื้อรังลดลง อย่างมีนัยสำคัญ (0.9 ± 1.6, 0.3 ± 0.9, p < 0.001) อัตราการนอนโรงพยาบาลจากโรคปอดอุดกั้นเรื้อรังลดลง อย่างมีนัยสำคัญ (0.2 ± 0.8, 0.1 ± 0.4, p < 0.001) อัตราการเกิดภาวะหายใจล้มเหลวจากโรคปอดอุดกั้นเรื้อรังลดลง อย่างมีนัยสำคัญ (0.04 ± 0.25, 0.008 ± 0.090, p = 0.020) การวิเคราะห์แบบพหุตัวแปรพบว่า ผู้ป่วยที่มีการกำเริบของโรคปอดอุดกั้นเรื้อรังมากกว่า 1 ครั้งต่อปีมีโอกาสที่จะเกิดการกำเริบของโรคปอดอุดกั้นเรื้อรังซ้ำ มากกว่าผู้ป่วยที่ไม่เคยเป็นเกือบสามเท่าหลังเข้าการศึกษาอย่างมีนัยสำคัญ (Adjusted Odds ratio 2.80, 95% CI 1.08-7.26, p = 0.034)*

สรุป*: การดูแลผู้ป่วยโรคปอดอุดกั้นเรื้อรังโดยสหสาขาวิชาชีพ ทำให้ผลการศึกษาทางคลินิกดีขึ้นอย่างมีนัยสำคัญ*