

Health Literacy and Acute Exacerbation among Patients with Chronic Obstructive Pulmonary Disease, Hospitals of Honghe City, The People's Republic of China*

ความรอบรู้ด้านสุขภาพและการกำเริบเฉียบพลันในผู้ป่วยโรคปอดอุดกั้นเรื้อรัง

โรงพยาบาลเมืองแหง สาธารณรัฐประชาชนจีน*

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บทคัดย่อ

ผู้ป่วยโรคปอดอุดกั้นเรื้อรังต้องการการการดูแลและรักษาในระยะยาว หากผู้ป่วยมีความรอบรู้ด้านสุขภาพไม่เพียงพออาจจะเพิ่มความเสี่ยงของการกำเริบเฉียบพลัน วัตถุประสงค์ของการศึกษาเชิงพรรณนาเนี้ยคือเพื่อศึกษาความรอบรู้ด้านสุขภาพ อาการกำเริบเฉียบพลันและความสัมพันธ์ระหว่างความรอบรู้ด้านสุขภาพและการกำเริบเฉียบพลันของผู้ป่วยโรคปอดอุดกั้นเรื้อรัง โรงพยาบาลเมืองแหง สาธารณรัฐประชาชนจีน การคัดเลือกกลุ่มตัวอย่างใช้วิธีการสุ่มตัวอย่างแบบเจาะจง ประกอบด้วยผู้ป่วยโรคปอดอุดกั้นเรื้อรัง ระยะที่ 1 และระยะที่ 2 จำนวน 145 ราย จากโรงพยาบาลระดับตติยภูมิ 3 แห่ง เครื่องมือที่ใช้ในการวิจัย ได้แก่ แบบร่วบรวมข้อมูลส่วนบุคคล ที่ผู้วัยพัฒนาขึ้น แบบวัดความรอบรู้ด้านสุขภาพเชิงหน้าที่ การสื่อสารและความรอบรู้ด้านสุขภาพที่สำคัญ (FCCHL) ที่พัฒนาโดยอิชิกาวาและคณะ (Ishikawa et al., 2008) และแปลเป็นภาษาจีนโดย ชาง (Zhang, 2018) และแบบบันทึกจำนวนครั้งของการกำเริบเฉียบพลัน ค่าสัมประสิทธิ์การทดสอบชี้ของ แบบวัดความรอบรู้ด้านสุขภาพฉบับภาษาจีนคือ .94 วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนาและค่าสหสัมพันธ์อันดับสเปียร์แมน

ผลการศึกษาพบว่า

ผลการวิจัยพบว่ามีความสัมพันธ์เชิงลบอย่างมาระหว่างความรอบรู้ด้านสุขภาพและการกำเริบเฉียบพลัน ($r = -0.73, p < 0.01$) นอกจากนี้ยังมีความสัมพันธ์เชิงลบระหว่างอาการกำเริบเฉียบพลันและความรอบรู้ด้านสุขภาพเชิงหน้าที่ ($r = -0.58, p < 0.01$) ความรอบรู้ด้านสุขภาพด้านการสื่อสาร ($r = -0.56, p < 0.01$) และความรอบรู้ด้านสุขภาพที่สำคัญ ($r = -0.57, p < 0.01$)

ผลการศึกษานี้อาจเป็นประโยชน์สำหรับพยาบาลในทางคลินิก ในการพัฒนาการให้ความรู้ที่มีประสิทธิภาพแก่ผู้ป่วยเพื่อลดอาการกำเริบเฉียบพลันโดยการเพิ่มความรอบรู้ด้านสุขภาพของผู้ป่วย

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คำสำคัญ: โรคปอดอุดกั้นเรื้อรัง ความรอบรู้ด้านสุขภาพ การกำเริบเฉียบพลัน

Abstract

Patients with Chronic Obstructive Pulmonary Disease (COPD) require long-term care and treatment. They frequently experience deficient health literacy, which could increase the times of acute exacerbation of COPD. The purpose of this descriptive correlational study was to identify the health literacy, the acute exacerbation of COPD and the relationship between health literacy and acute exacerbation among patients with COPD in hospitals in Honghe City, the People's Republic of China. A purposive sampling method was used to select 145 stage I and stage II COPD patients from three tertiary hospitals. The research instruments included: a demographic data form developed by the researcher; the Chinese version of the Functional, Communicative and Critical Health Literacy Scale (FCCHL) developed by Ishikawa et al. (2008) and translated into Chinese by Zhang (2018); and a data recording form for the number of acute exacerbation events. The test-retest coefficient of the Chinese version of the FCCHL was 0.94. Data were analyzed using descriptive statistics and Spearman's rank-order correlation coefficient.

The results showed that there was a strongly negative relationship between health literacy and acute exacerbation ($r = -0.73$, $p < 0.01$). There was also a strongly negative relationship between acute exacerbation and functional health literacy ($r = -0.58$, $p < 0.01$), communicative health literacy ($r = -0.56$, $p < 0.01$) and critical health literacy ($r = -0.57$, $p < 0.01$).

The results of this study can help clinical nurses to develop effective educational interventions to lower acute exacerbation in patients with COPD by improving patients' health literacy.

Keywords: Chronic Obstructive Pulmonary Disease, Health literacy, Acute exacerbation

Background and Significance

China has one of the largest Chronic Obstructive Pulmonary Disease (COPD) populations in the world (Li et al., 2018). COPD affects nearly 100 million persons and causes 1 million deaths annually (Wang et al., 2018). The acute exacerbation of COPD has a major and growing impact on the world's global health burden. About 70% of stage I and II COPD patients had at least one exacerbation (Wang et al., 2018). However, the actual incidence of exacerbations

in stage I and II COPD may be higher (Williams et al., 2017). Reduced exacerbation is one of the goals of COPD management (GOLD, 2019). Stage I and II COPD patients' health burden will increase if patients experience frequent acute exacerbation. However, once patients have more health literacy, they are willing to take more effective actions to change their health-related behaviors, delay the progression of the disease, and eventually decrease instances of acute exacerbation and improve

their quality of life (Williams et al., 2017).

Health literacy represents the cognitive and social skills that determine the motivation and ability of individuals to gain access to, understand and use information in ways that promote and maintain good health (Nutbeam, 2000). A previous study found that health literacy in patients with COPD was present at low levels (O'Conor et al., 2019). Once COPD patients have higher health literacy, they have sufficient skills to understand health-related information, so patients may slow disease progression and decrease the frequency of acute exacerbation.

Acute exacerbation is defined as an acute condition characterized by a worsening of the patient's respiratory symptoms (typically dyspnea, cough, increased sputum volume, and/or sputum purulence) which is beyond normal day-to-day variations and leads to a change in medication (CTS, 2014). The acute exacerbation of COPD has a major and growing impact on the global health burden around the world. Reducing exacerbation is one of the goals of COPD management (GOLD, 2019). If stage I and II COPD patients experience frequent acute exacerbation, they will have worse disease progression, and the deterioration of lung function will be faster than in patients with non-exacerbation, eventually increasing the patients' health burden. Health literacy may play an important part in decreasing the acute exacerbation of COPD since it requires effective self-care skills to maintain quality of life and avoid exacerbations (Kiser et al., 2012).

There have been no studies investigating the relationship between health literacy and acute exacerbation among COPD patients in China. Therefore, this study can provide knowledge about health literacy and acute exacerbation among COPD patients who are in stage I or II, and about how to reduce the frequency of acute exacerbation. The objectives of this study were to explain the relationship between health literacy and acute exacerbation among COPD patients at stage I and II in Honghe City, the People's Republic of China.

objectives

1. To explain health literacy among COPD patients at hospitals in Honghe City, the People's Republic of China.
2. To explain acute exacerbation among COPD patients at hospitals in Honghe City, the People's Republic of China.
3. To explain the relationship between health literacy and acute exacerbation among COPD patients at hospitals in Honghe City, the People's Republic of China.

Research questions

1. How is health literacy among COPD patients at hospitals in Honghe City, the People's Republic of China?
2. How is acute exacerbation among COPD patients at hospitals in Honghe City, the People's Republic of China?
3. How is the relationship between health literacy and acute exacerbation among COPD patients at hospitals in Honghe City, the People's Republic of China?

Conceptual Framework

The conceptual framework of this study was based on Nutbeam (2000)'s model of health literacy. According to Nutbeam, health-related outcomes are related to health literacy. Acute exacerbation is defined as the worsening condition of a patient with an increase in respiratory symptoms, including dyspnea, sputum purulence and/or sputum volume. Patients with COPD need to change their health-related behavior by improving health literacy to reduce exacerbation of COPD. Health literacy is defined as patients having cognitive and social skills to manage their own diseases; they can get more useful information about the disease and apply it in their daily lives to achieve better control their disease. It consists of three levels: (1) functional health literacy; (2) communicative health literacy; and (3) critical health literacy. COPD patients with high levels of health literacy lead to a high perception of disease management and change in behavior, improved disease symptoms, and reduced emergency department visits and hospitalization mortality, eventually leading to less exacerbation. Accordingly, it is hypothesized that higher health literacy is associated with lowering the rates of exacerbation among COPD patients.

Methodology

Population and sampling

Purposive sampling was used to recruit patients in three tertiary hospitals in Honghe City. Power analysis was used to confirm sample size. The minimum acceptable power was 0.8, and alpha = 0.05, power of test = 0.95,

and effect size = 0.3 could be selected. The sample size of each hospital was determined based on the proportion of the population. The total size was 145, including 57 patients in the First People's Hospital of Honghe state; 45 patients in the Third People's Hospital of Honghe State; and 43 patients in the People's Hospital of Gejiu. Inclusion criteria was as follows: 1) having been medically diagnosed with stage I or II COPD at least one year by a physician based on a lung function test; 2) having the ability to communicate using Chinese language; 3) being a patient who received service at an outpatient department, experienced admitted were recruited into the study; 4) having been identified as having acute exacerbation by a physician in the medical records; and 5) being willing to participate in the present study. Exclusion criteria included COPD patients with comorbidities (heart failure, renal failure and severe condition).

Research instruments

The research instrument used in this study consisted of three parts: 1) The Demographic Data Form, developed by the researcher; 2) The Functional, Communicative and Critical Health Literacy scale (FCCHL), developed by Ishikawa et al. (2008), and consisting of 14 items, divided into 3 levels, including low, moderate and high levels of health literacy. Total item scores ranged from 14 to 56, with each item score having a choice of 1 = never, 2 = rarely, 3 = sometimes, or 4 = often. Higher scores indicated a higher level of health literacy. The Chinese version of the FCCHL was developed by Zhang et al. (2018) based on the original

FCCHL version; it has the same structure and items as the original scale (FCCHL). For this study, the Cronbach's alpha of the 14-item FCCHL was .937); 3) Acute exacerbation was diagnosed by a physician and recorded on the participant's medical chart. Participants were asked how many times they had been admitted to the emergency department in the last year. For instances of acute exacerbation, 1-2 times indicated infrequent acute exacerbation while 3 or more times indicated frequent exacerbation.

Ethical Considerations

The study was approved by the ethics committee of the Faculty of Nursing, Chiang Mai University, Thailand, and the First People's Hospital in Honghe City, China. Furthermore, participants were provided with an information sheet explaining the purposes of the study, and they voluntarily participated. They were told that whether they decided to participate or not, their treatment as patients would not be affected and they could withdraw any time without reason. Informed consent was obtained before distributing the questionnaires.

Data collection

1. The researcher submitted the research proposal and instruments to the Research Ethnics Committee of Faculty of Nursing, Chiang Mai University for approval.

2. After receiving the approval, the researcher submitted all documents, including a research proposal, an application letter of permission to collect the data and copies of the data collection instruments to the directors of the nursing departments of the three selected hospitals to ask for approval and for

collecting data.

3. After receiving approval from the nursing director of each hospital, the researcher met the head nurse in each hospital, and gave them information about the study that included the objectives, benefits and data collection procedures of the study. A convenient sampling method was employed to choose samples who fulfilled the inclusion criteria. Convenient sampling methods were used for selecting subjects from the sample frame of each unit excluding the ones who had participated in the reliability test.

4. The researcher wore casual clothes instead of a nursing uniform to collect data to prevent any undue influence. The researcher identified the eligibility criteria by asking that the persons who agreed to participate were invited in this study. The researcher explained the objectives, benefits, human rights protection, and data collection, as well as the duration for the participants in this study. The participants were informed they could decide to participate or withdraw from this study at any time without penalty or loss of treatment.

5. The readiness of participants was assessed; participants feeling physically uncomfortable or unpleasant would be unselected before data collection.

6. The questionnaire and consent form were distributed to the participants in a quiet private room in the inpatient department and outpatient department after participants agreed to join in this study. The questionnaire was distributed during their leisure time after finishing treatment and seeing a doctor for inpatients

and outpatients, respectively. Therefore, there was no effect on the patients' queue position from seeing a doctor. The researcher presented a board to show the participants alternative answers for each item without explanation, and participants answered the questions by themselves. Participants required around 10-15 minutes to fill out the questionnaire, and could take a break at any time. All participants answered all questions.

7. The completed questionnaires and signed informed consent forms were checked by the researcher. In addition, the researcher counted the number of all valid questionnaires for each hospital; the questionnaire were completed by 100%.

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS), English version 13, and the significance level was set at .05. Continuous variables were analyzed in terms of mean, standard deviation (SD), and range. Categorical variables were described as frequency and percentage. The relationship between health literacy and acute exacerbation was examined using Spearman's correlation

coefficient.

Results

This study revealed that the majority of the participants were male (78.62%), while females accounted for 21.38%. Their ages ranged from 40 to 93 ($M\bar{X} = 68.6$, $SD = 10.88$). About 34.48% of the participants were between 71-80 years old. A majority of the participants (44.14%) had a junior high school educational level. Considering monthly incomes, 36.55% of the participants had monthly incomes between 1000-3000 yuan. All participants (100%) were covered by medical insurance. In terms of their smoking history, 61 participants had never smoked (42.07%) while 84 participants had a history of smoking cigarettes (57.93%).

Patients perceived their total health literacy at a moderate level with a mean of 31.93 ($SD = 7.92$). In terms of each level of health literacy, the highest score was functional health literacy, which was at a moderate level with a mean of 12.57 ($SD = 4.61$), and the mean scores of access to communicative and critical were at moderate levels with scores of 11.21 ($SD = 2.95$) and 8.16 ($SD = 2.26$), respectively (Table 1).

Table 1 Mean, Standard Deviation and Level of Health Literacy as Perceived by Subjects (n = 145)

Health Literacy	Possible score	Mean	SD	Level
Functional health literacy	5.0-20.0	12.57	4.61	Moderate
Communicative health literacy	5.0-20.0	11.21	2.95	Moderate
Critical health literacy	4.0-16.0	8.16	2.26	Moderate
Total health literacy	14.0-56.0	31.93	7.92	Moderate

Most participants (55.86%) had 2 instances of acute exacerbation in the previous 12

months, while 25.51% of the participants had 1 instance of acute exacerbation and 10.34% and

8.29% of the participants experienced acute exacerbation 3 times and more than 3 times in the previous 12 months, respectively.

There was a strong negative relationship between health literacy and acute exacerbation in Table 2 ($rs = -0.73$, $p < 0.01$). There was also

a strong negative relationship between acute exacerbation and functional health literacy ($rs = -0.58$, $p < 0.01$), communicative health literacy ($rs = -0.56$, $p < 0.01$) and critical health literacy ($rs = -0.57$, $p < 0.01$).

Table 2 Relationships Between Total and Each Level Health Literacy and Acute Exacerbations as Perceived by the Subjects (n = 145)

	Functional HL			Communicative HL			Critical HL			Total HL		
	Mean	SD	rs	Mean	SD	rs	Mean	SD	rs	Mean	SD	rs
Acute Exacerbation	-.58**			-.56**			-.57**			-.73**		
1 time	16.51	2.57		13.38	2.02		10.00	1.93		39.89	4.23	
2 times	12.02	4.45		11.02	2.90		7.93	2.05		30.75	6.35	
3 times	10.27	3.37		9.47	1.96		6.80	1.15		26.53	4.49	
>3 times	6.92	1.38		7.92	1.44		5.75	1.22		20.58	3.32	

** $p < 0.001$

Discussion

1. Health Literacy

This study revealed that COPD patients perceived total and individual levels of health literacy to be at a moderate level. The results can be discussed based on Nutbeam's theory.

Functional Health Literacy. This dimension reflects that COPD patients have sufficient basic skills in reading and writing to be able to understand prescription, medication, and treatment to gain health-related information. The results of this study showed that most COPD patients perceived a moderate level of functional health literacy (mean = 12.57, SD = 4.61). Items 1 and 5 had the lowest scores. On the contrary, item 3 had the highest score for functional health literacy.

Zhang et al. (2014) demonstrated that a high level reading score and medication ad-

herence reduced acute exacerbation. Patients' understanding skills decline with aging which decreased patients' ability to read medication labels and understand prescriptions. About half of the patients in this study were elderly. Sufficient functional health literacy gives COPD patients enough reading and writing skills to understand disease information, such as how to use inhaler medication, oxygen therapy, and how to quit smoking and prevent acute exacerbation of COPD. In this way, COPD patients could decrease acute exacerbation when they had enough functional health literacy.

Communicative Health Literacy. This dimension reflects that COPD patients have advanced cognitive skills with social skills which can be used to participate in everyday activities actively and to apply new information to changing circumstances. The results of this

study showed that COPD patients have moderate levels of communicative health literacy (mean = 11.21, SD = 2.95). Item 10 had the lowest score. On the contrary, item 9 had the highest score for communicative health literacy.

Heijmans et al. (2015) pointed out that enough confidence could promote communicative health literacy. Confidence plays a key role in patients seeking health knowledge and actively changing their behavior. Diffident results COPD patients have less capacity to communicate with professionals and others about health-related information, such as information about how to choose suitable pulmonary rehabilitation and how to monitor lung function correctly. Besides, the elderly always stay at home due to worsening conditions and aging which affects patients' communication with professionals about disease-related information and results in them getting limited health information.

Critical Health Literacy. This dimension reflects that COPD patients have more advanced cognitive skills and social skills, which can be applied to critically analyze information, and to use this information to control life events and situations. The results of this study showed that most COPD patients had a moderate level of critical health literacy (mean = 8.16, SD = 2.26). Item 13 had the lowest score. On the contrary, item 12 had the highest score for critical health literacy.

Lower critical health literacy could decrease a patient's ability to analyze daily information and control acute exacerbation (Liu, 2018). COPD patients with low critical

health literacy not only cannot deal with uncomfortable conditions when discharged, but also have less ability to change health-related behavior. COPD patients with high critical health literacy could pay more attention in cognitive skills to analyze which methods are suitable for one's own condition, and patients are willing to take actions to choose all kinds of channels to change unhealthy behavior to actively avoid acute exacerbation, such as how to choose a healthier lifestyle to avoid acute exacerbation, how to choose a reasonable diet to ensure energy consumption, how to avoid risk factors related to one's own disease, or how to arrange frequent exercise time to improve lung function.

However, the results are different from previous studies in other regions of China, and even in other countries. In China, one of these studies was done by Xiao (2015) in Gansu, which showed the health literacy of COPD patients at a low level (mean = 6.07), and the same result was obtained in a study conducted by Wang (2012) in COPD patients (mean = 6.07). At the same time, Zeng et al. (2019) also got similar results for COPD patients who had low levels of health literacy (mean = 6.22). In other countries, Omachi et al. (2013) concluded that COPD patients had a low level of health literacy (mean = 12.53) in the USA, and Kale et al. (2015) conducted the same results in New York and Chicago.

A probable explanation was that all of the COPD patients in this study were stage I and II COPD, so the disease progression was not worse than stage III-IV COPD patients. Early

stage patients have better cognition and lung function than severe stage COPD patients (Liu, 2018). This condition allowed these patients to exchange and communicate disease-related information better than stage III and IV patients. Besides, 54.5% patients in this study had no smoking behavior, and as we know, smoking is a significant factor related to COPD, and even causes acute exacerbation. Lower smoking behavior results in higher health literacy as reported by Wang (2012). However, all patients in this study had medical insurance which could provide patients a better condition to afford medical costs (Wang, 2012). This might be a reason why the results were different from other studies.

2. Acute Exacerbation

Most subjects (55.86%) had acute exacerbation twice in the previous 12-month period, 25.51% subjects had acute exacerbation once, and 10.34% and 8.29% of subjects had experienced acute exacerbation 3 or more than 3 times in the previous 12 months, respectively. Comparing acute exacerbation with demographic data, no factors had a significant impact on acute exacerbation. However, it can be seen from the literature review that other factors could cause acute exacerbation.

Lower lung function leads to higher rates of exacerbation, and the decline of lung function is more rapid in stages I and II COPD than in stages III and IV (Halpin et al., 2017). In addition, smoking could lead to a decline in lung function in stages I and II (Halpin et al., 2017). In this study, all patients had stage I or II COPD, and most patients still smoked, which

could cause lung function to decline quickly.

An additional related factor is infection. Increased lower respiratory tract infections are common in stages I and II COPD (Alahmari et al., 2016). In this study, most participants were elderly persons who had lower immunity and lung function; this could cause acute exacerbation.

Another related factor is exercise capacity. Limited daily exercise is a risk behavior related to acute exacerbation (Alahmari et al., 2016). Most participants in this study were elderly persons who had a lower monthly income. The elderly prefer to stay at home all day due to worsening symptoms, and patients who had lower monthly income spent less money and energy on seeking out health-related exercises to maintain their health status. Therefore, limited activity could be another cause of acute exacerbation.

3. Relationship of Health Literacy and Acute Exacerbation among COPD Patients

There was a strong negative relationship between overall health literacy and acute exacerbation ($r = -0.73$, $p < 0.01$). One important finding of this study was that COPD patients who reported themselves as having higher levels of health literacy tended toward lower acute exacerbation. This result was consistent with a study done by Rodríguez et al. (2016) which revealed that patients with low health literacy had frequent acute exacerbation. Improving health literacy can be an effective tool for education and prevention of disease management behaviors that improve patient compliance (Zhang et al., 2014).

Enough functional health literacy could help COPD patients to read and understand medication labels and prescriptions (Omachi et al., 2013). COPD patients could have more effective disease-related information to decrease acute exacerbation once COPD patients had enough functional health literacy.

Communicative health literacy consists of higher-level communicative and social skills required to extract and discuss information with others (Nutbeam, 2009). COPD patients with high communicative skills are characterized by the self-confidence to act independently on advice, and to interact successfully with the health care system and providers (Omachi et al., 2013). COPD patients could change unhealthy behavior via communicating with professionals to reduce exacerbation.

Critical health literacy requires higher cognitive skills to analyze and make decisions to improve health status (Omachi et al., 2013). For COPD patients, health-related information, including how to prevent acute exacerbation of COPD, how to use long term oxygen therapy, and how to take medications directly after discharge, along with personal and social skills, including how to interact with professionals so that learn the correct way to use an inhaler, choose suitable ways to improve exercise capacity and find appropriate treatment methods could prevent acute exacerbation (CTS, 2014). Once COPD patients had sufficient critical health literacy, they could change unhealthy behaviors and could have the capacity to choose treatment and exercise which was suitable for themselves. Therefore, COPD patients

will decrease acute exacerbation when they have enough critical health literacy.

Conclusions and Recommendations

In conclusion, the results of this study could help clinical nurses to develop effective education interventions to lower acute exacerbation in patients with COPD by improving patients' health literacy.

Application of research findings

This research could be a baseline regarding the relationship between health literacy and acute exacerbation among COPD patients in Honghe City. Clinical nurses could provide a variety of health education for COPD patients to enhance knowledge, and change unhealthy behaviors, making COPD patients decrease instances of acute exacerbation and maintain quality of life.

Suggestions for further research

Interventions study regarding the health literacy of COPD patients should be designed and its effectiveness tested in respiratory departments and other hospitals. Improving health literacy may a key factor in decreasing the exacerbation of COPD by conducted useful interventions. Thus, health literacy in COPD patients will be improved.

References

Alahmari, A. D., Kowlessar, B. S., Patel, A. R., Mackay, A. J., Allinson, J. P., Wedzicha, J. A., & Donaldson, G. C. (2016). Physical activity and exercise capacity in patients with moderate COPD exacerbations. *European Respiratory Journal*, 48(2), 340-349.

Chinese Thoracic Society (2014). Guidelines for diagnosis and treatment of COPD (2013 revision). *Chinese Journal of Advanced Medicine*, 6(2), 67-80. (in Chinese)

Ding, S. S. (2019). Self-management and health literacy in patients with chronic obstructive pulmonary disease. *Industrial Hygiene and Occupational Disease*, 45(1), 7-10. (in Chinese) doi:CNKI:SUN:GYWZ.0.2019-01-002

Global Initiative for Chronic Obstructive Lung Disease. (2019). *Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease*. Bethesda, MD: Gold.

Halpin, D. M., Miravitles, M., Metzdorf, N., & Celli, B. (2017). Impact and prevention of severe exacerbations of COPD: A review of the evidence. *International Journal of Chronic Obstructive Pulmonary Disease*, 12, 2891-2908. doi.org/10.2147/COPD.S139470

Heijmans, M., Waverijn, G., Rademakers, J., Van der Vaart, R., & Rijken, M. (2015). Functional, communicative and critical health literacy of chronic disease patients and their importance for self-management. *Patient Education and Counseling*, 98(1), 41-48.

Ishikawa, H., Takeuchi, T., & Yano, E. (2008). Measuring functional, communicative, and critical health literacy among diabetic patients. *Diabetes Care*, 31(5), 874-879.

Li, M., Wang, F., Chen, R., Liang, Z., Zhou, Y., Yang, Y., . . . Hu, H. (2018). Factors contributing to hospitalization costs for patients with COPD in China: A retrospective analysis of medical record data. *International Journal of Chronic Obstructive Pulmonary Disease*, 13, 3349-3357. doi.org/10.2147/COPD.S175143

Liu, Y. (2018). *The stabilization of health literacy in patients with moderately severe COPD and its relationship with the compliance of rehabilitation* (Unpublished doctoral dissertation). (in Chinese)

Kiser, K., Jonas, D., Warner, Z., Scanlon, K., Shilliday, B. B., & DeWalt, D. A. (2012). A randomized controlled trial of a literacy-sensitive self-management intervention for chronic obstructive pulmonary disease patients. *Journal of General Internal Medicine*, 27(2), 190-195.

Nutbeam, D. (2000). Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, 15(3), 259-267.

O'Conor, R., Muellers, K., Arvanitis, M., Vicencio, D. P., Wolf, M. S., Wisnivesky, J. P., & Federman, A. D. (2019). Effects of health literacy and cognitive abilities on COPD self-management behaviors: A prospective cohort study. *Respiratory Medicine*, 160, 105630. doi.org/10.1016/j.rmed.2019.02.006

Omachi, T. A., Sarkar, U., Yelin, E. H., Blanc, P. D., & Katz, P. P. (2013). Lower health literacy is associated with poorer health status and outcomes in chronic obstructive pulmonary disease. *Journal of General Internal Medicine*, 28(1), 74- 81.

Puente-Maestu, L., Calle, M., Rodríguez-Hermosa, J. L., Campuzano, A., de Miguel Díez, J., Álvarez-Sala, J. L., . . . Lee, S. Y. D. (2016). Health literacy and health outcomes in chronic obstructive pulmonary disease. *Respiratory Medicine*, 115, 78-82. doi.org/10.1016/j.rmed.2016.04.016

Rodríguez, E., Tena, J. R., Hermosa, J. R., Calle, M., Campuzano, A., Pérez, M. J., . . . Puente, L. (2016). Health literacy degree in relation to the severity and risk of COPD. *Monografías de Archivos de Bronconeumología*, 3(4), 1-18.

Wang, C., Xu, J., Yang, L., Xu, Y., Zhang, X., Bai, C., . . . Huang, K. (2018). Prevalence and risk factors of chronic obstructive pulmonary disease in China (the China Pulmonary Health [CPH] study): A national cross-sectional study. *The Lancet*, 391(10131), 1706-1717. (in Chinese)

Wang, L. (2012). *Patients with chronic obstructive pulmonary disease health literacy and self-management research* (Unpublished doctoral dissertation). Central South University. (in Chinese)

Williams, M. T., Effing, T. W., Paquet, C., Gibbs, C. A., Lewthwaite, H., Li, L. S. K., . . . Johnston, K. N. (2017). Counseling for health behavior change in people with COPD: Systematic review. *International Journal of Chronic Obstructive Pulmonary Disease*, 12, 2165. doi 10.2147/COPD.S111135

Xiao, C. Z. (2015). Investigation and study on health literacy status of patients with chronic obstructive pulmonary disease. *Health Vocational Education*, 33(17), 118-120. (in Chinese)