


Factors Associated with Potentially Preventable Hospitalizations for COPD Patients: A Qualitative Analysis of Patient Perspectives

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Purpose: Ambulatory Care Sensitive Conditions (ACSCs) refer to hospital encounters that could potentially be prevented with improved primary care. Chronic Obstructive Pulmonary Disease (COPD) as one of the typical ACSCs, and its hospitalization is considered potentially preventable through the quality primary care. However, the literature on factors influencing Potentially Preventable Hospitalization (PPH) has rarely been conducted from the patient perspective, especially in China. Our study aims to explore the factors influencing PPH for COPD patients.

Patients and Methods: This was a qualitative study. Twenty participants hospitalized by COPD were recruited from the healthcare institutions in China. The semi-structured interviews were conducted from July to August 2022. The data were gathered and analyzed systematically using thematic analysis.

Results: Patients' experiences for PPH generated two main themes: environmental characteristics and personal characteristics. Sub-themes included accessibility of healthcare resources, medical services capability, healthcare insurance policy, working environment, disease cognition, health awareness, disease burden, income constrain, disease perception, negative emotions, and comorbidity.

Conclusion: Environmental characteristics and personal characteristics are factors associated with PPH for COPD patients. It is important to enhance the medical service ability, improve the accessibility of healthcare resources and the health literacy of patients.

Keywords: preventable hospitalizations, ambulatory care-sensitive conditions, chronic obstructive pulmonary disease, patient perspective, qualitative research

Introduction

Ambulatory Care Sensitive Conditions (ACSCs) refer to hospital encounters that could potentially be prevented with improved primary care.¹ Chronic Obstructive Pulmonary Disease (COPD) characterized by chronic respiratory symptoms and airflow obstruction, represents a preventable and treatable disease. As one of the typical ACSCs,² its management heavily relies on early outpatient care services. Through the quality primary care, hospitalization of patients with COPD is considered potentially preventable. However, according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) case definition, 10.3% people aged 30–79 years had COPD worldwide in 2023,³ leading to high economic burden mainly caused by acute hospitalizations for exacerbations,⁴ which make up the majority of medical expenses. It is reported that COPD will cause a global economic loss of \$4.326 trillion, with China having the highest absolute economic burden of \$1.363 trillion.⁵ In China, COPD patients suffer from 0.5 to 3.5 acute exacerbations per year,⁶ the direct medical cost of COPD ranges from \$72 to \$3656 per capita per year.⁷

To reduce the Potentially Preventable Hospitalization (PPH) rates and the resulting medical expenses, there has been increasing attention devoted to understanding factors affecting PPH mostly used administrative data and found that, patient

characteristics level, such as gender,^{8–10} age,^{11,12} education background,^{13,14} ethnicity,^{15,16} socioeconomic status,¹⁷ and healthcare insurance coverage,^{18–20} and healthcare system level, including accessibility to primary care,²¹ continuity of care,^{8,22} primary healthcare resourcing²³ professional characteristics of doctors,²⁴ associated with the increased risk of PPH. However, most of the PPH studies cited above are from the developed countries and regions and most studies focused on multiple ACSCs, which may exist some confounding factors. Although there are many similarities, there are also differences influencing PPH that may limit the applicability to Chinese context. Besides, the social variables outside the purview of clinical medicine of PPH explored in these studies are limited, and there is little literature conducted from patient perspectives, which helped to develop targeted interventions.

The aim of this study is to identify factors associated with PPH from patient experience in China because patient perspective could provide a more holistic view of factors necessitating their hospitalizations and reflecting specific challenges in outpatient disease management, which provides valuable information for policy makers and clinical professionals to understand the process of patients' hospitalization and develop targeted intervention measures to reduce the PPH rate and medical burden.

Methods

Study Design

The qualitative methodology was selected for this study, which could provide a better and in-depth understanding of the research issues. According to the relevant factors affecting COPD hospitalization in the existing literature, a semi-structured interview guide was formulated, including the demographic characteristics, behavior and living habits, health management, and medical choice of patient. The semi-structured interview guide was improved after initial development. A completed Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist is attached as [Additional file 1](#).

Sample and Setting

PPH rates for COPD were relatively high in China,²⁵ especially in less developed areas, with deficient healthcare resources. Therefore, we selected Chishui city, located in Southwest China, and in the northernmost part of Guizhou province, as our study area. The residents of Chishui city had a high incidence rate of COPD, ranking second in the cause of death.

Participants who were hospitalized for COPD were recruited during hospitalization, from the healthcare institutions, covering a three tiered health care delivery system, including village clinics, township health centers (THCs), and county hospitals.²⁶ Participants hospitalized for COPD PPH were identified for the study admission following the Organization for Economic Co-operation and Development (OECD) standards.¹

Inclusion criteria: Patient aged 15 and older; All non-maternal/non-neonatal hospital admissions with a principal diagnosis code of COPD (including J40, J410, J411, J418, J42, J430, J431, J432, J438, J439, J440, J441, J448, J449).

Exclusion criteria: Cases where the patient passed away during hospital admission; Cases resulting from transfers from another acute care institution; Obstetric hospitalizations; Same-day admissions.

Eligible subjects were recruited as follows: First, we contacted the attending physician of the hospitalized patients and explained the purpose of this study to obtain the consent of the attending physician and help to recommend potential qualified subjects to the research team. Second, the research team looked up the medical data of potential qualified subjects and identified COPD PPH patients according to the inclusion and exclusion criteria. Last, through the introduction of the attending physician, the informed consent of the patients participating in this study was obtained, and then the interview was officially started. We first contacted the attending physician who were respiratory physicians because they knew more about the patient's situation and could help the research team to find qualified subjects more quickly. With the help of the attending physician, patients are more likely to trust the research team. All participants were able to express their views and experiences adequately.

Purposive sampling was used as it ensured access to COPD patients who had experience of PPH, and the selection strategy was maximize the variation regarding age, residence, and complex social backgrounds. Twenty eligible patients were recruited as participants by this method. A detailed description of participants is presented in [Table 1](#).

Table I Descriptive Characteristics of Participants

ID	Gender	Age	Educational Background	Reason for Hospitalizations	Smoking History	Method of Cooking
A01	Male	70	Higher and further education	Acute exacerbation	Ex-smoker	Electricity
A02	Male	81	Primary school and lower	Acute exacerbation	Ex-smoker	Electricity
A03	Male	74	Higher and further education	Worsening symptoms	Ex-smoker	Electricity
A04	Male	82	Primary school and lower	Acute exacerbation	Ex-smoker	Electricity
A05	Male	71	Primary school and lower	Worsening symptoms	Ex-smoker	Electricity
A06	Male	67	Primary school and lower	Worsening symptoms	Ex-smoker	Electricity
A07	Male	55	Primary school and lower	Worsening symptoms	Ex-smoker	Electricity
A08	Male	66	Primary school and lower	Acute exacerbation	Ex-smoker	Wood
A09	Male	59	Primary school and lower	Worsening symptoms	Current smoker	Electricity
A10	Male	75	Primary school and lower	Acute exacerbation	Current smoker	Electricity
A11	Female	68	Secondary school	Worsening symptoms	No smoking	Wood
A12	Male	56	Secondary school	Acute exacerbation	Ex-smoker	Electricity
A13	Male	52	Primary school and lower	Worsening symptoms	Ex-smoker	Electricity
A14	Male	68	Primary school and lower	Acute exacerbation	Current smoker	Wood
A15	Female	64	Primary school and lower	Acute exacerbation	Ex-smoker	Wood
A16	Male	72	Primary school and lower	Worsening symptoms	Ex-smoker	Wood
A17	Male	79	Secondary school	Worsening symptoms	No smoking	Electricity
A18	Male	60	Secondary school	Acute exacerbation	Ex-smoker	Used to burn wood
A19	Female	62	Secondary school	Worsening symptoms	No smoking	Used to burn wood
A20	Female	61	Primary school and lower	Acute exacerbation	No smoking	Used to burn wood

Data Collection

The interviews were conducted with each participant between July 2022 and August 2022. The semi-structured guide was employed to take in-depth interviews and to collect data, which allowed participants to fully express their experiences for PPH, their attitudes, and practices of disease management. Face-to-face interviews took place in the patient ward and lasted 20–40 minutes. The researcher recorded the whole process of the interview with informed consent and took field notes. To achieve data saturation, data analysis was conducted while collecting data until no new patient-reported factors emerged, the interviews ceased, we considered the thematic saturation was reached.

The study was conducted according to the Declaration of Helsinki. Ethical approval was granted from Ethics Committee of Sichuan University (K2018087). All participants provided with written informed consent, including consent for us to record and report anonymous data from interview.

Data Analysis

Interviews were transcribed conversationally and analyzed using thematic analysis proposed by Braun and Clarke.²⁷ Microsoft Word and Excel was used for analysis. The analysis process included the following steps: (1) after transcribed, researchers re-read the transcripts to develop a general understanding of patients' experiences and perform initial coding line by line after identifying meaningful phrases; (2) the initial codes with the same or similar meaning were gathered to form categories through interpretation of their experiences; (3) refined the categories to form themes, and established the connections between themes and categories; (4) identified the main themes related to research question.

Results

After careful analysis from patient experiences, we summarized factors influenced PPH into environmental characteristics and personal characteristics (Figure 1). The environmental characteristics were the primary healthcare system, health policy environment and working environment that affected PPH. Personal characteristics included economic condition, cognition and behavior habits. Among them, disease perception was the most immediate factor that motivates patients to seek medical services.

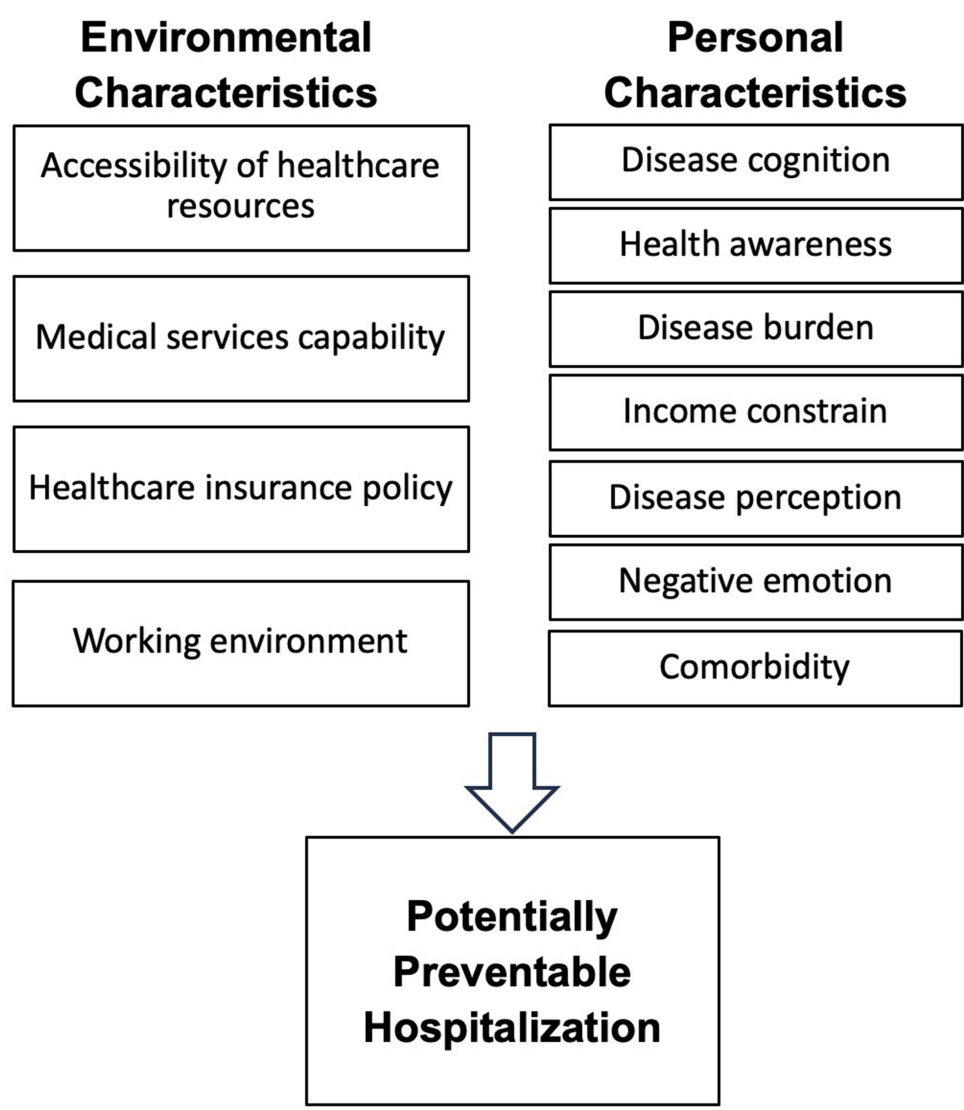


Figure 1 Factors associated with PPH for COPD.

Environmental Characteristics

Accessibility of Healthcare Resources

Medical resources included medical professionals, facilities, medicine, technology, services and other elements. Patients reported that the medicine and equipment in the study area were inaccessible, and the human resources were less and of low quality, which would have an impact on the treatment and management of patients and further affected PPH.

The THCs had few high-quality medical professionals and lack of medicine, many of the drugs could be bought in the neighboring city, but we did not have them there I went to another city to see a doctor before and had a simple examination to determine the cause of the disease, but we did not have this examination here. (A01)

Medical Services Capability

The medical services capability was affected by many factors including medical resources. Primary care professionals played an important role of healthcare gatekeeper, the function of health education, and follow-up management. However, in the study area, the number of medical professionals was relatively small and of relatively low quality, with limited capability to deal with patients’ emergencies. Medicine supply was insufficient, while drug therapy was the main treatment to maintain the stability of disease. These factors may affected the daily disease management and had the

possibility to generate inpatient service utilization. Furthermore, this may also affect patient medical choice, patients might bypass the primary institutions with poor medical service capability and directly to the high-level hospitals.

We do not have many medicine here My condition is not very serious, but today is the eighth day of my hospitalization, and the treatment effect is not very good. (A01)

The THC's could not treat my illness, and they did not have many medicines. If your condition is getting worse, you must come to higher-level hospitals. (A07)

Healthcare Insurance Policy

The guarantee of healthcare insurance policy was vital for COPD patients since they need to take medicine to control the development of disease for most of the time and avoid hospitalization caused by acute exacerbation. This study found that the policy formulated by the health administration department had imperfect compensation mechanism, reflected in the limited types of medicine reimbursement and the small amount of reimbursement. Moreover, we also found the policy publicity was not in place.

I had to buy medicine every month. In fact, the reimbursement lasted only half a year because the amount of reimbursement was not enough for chronic condition patients. Some inhalations were not covered by insurance. (A01)

I had not heard of the reimbursement policy, and I did not know whether my condition met the criteria. (A07)

Working Environment

Some patients in the study were engaged in work that exposed to dust environment for a long time, while the dust scattered in the air gradually damaged the function of the lung through the respiratory tract, and these participants did not take any protective measures. These patients' respiratory symptoms will become more and more serious, accompanied by cold or poor disease self-management ability, and the possibility of hospitalization for acute attack will be greater.

I had worked for 11 years, there were no protective measures, rules and awareness of self-protection at that time. (A09)

It was worth mentioning that there were three participants suffered from pneumoconiosis and gradually developed into COPD, accompanied by social vulnerability and low health literacy, leading to the utilization of inpatient services.

I did not have money to the hospital, and it was very expensive. Working outside and raising two children brought me a lot of pressure, and now I feel tired and unable to work. I only took medicine when I felt uncomfortable. I am still smoking now, I had tried to quit before, but the more I quit, the greater the addiction. (A09)

Personal Characteristics

Disease Cognition

Many patients in the study had limited education level and lack of disease cognition. They had a vague understanding of COPD, and some patients were not aware of the relationship between smoking and COPD, accordingly, they were unable to take measures to control the further development of the disease.

I have not heard of getting vaccinated against influenza or pneumonia. (A13)

I had a bad memory, and I could not remember how to manage the disease. The doctor told me not to smoke, but now I am still smoking. I thought smoking and non-smoking had little impacts on the disease. (A10)

Health Awareness

Long-term, on-time, regular medication was an efficient way to control the progression of disease. However, some patients automatically stopped taking medicine or forgot to take when the symptoms were alleviated or took it urgently when the symptoms appeared. Therefore, the treatment was not effective.

I would not take medicine if there were no symptoms. I only took it when the cough became severe. I would do some farm work when I felt well, and I did not take the medicine with me, so I forget to use it. (A15)

The harm caused by unhealthy lifestyle behaviors such as second-hand smoke and the traditional fuel combustion methods was more common. In rural areas, residents cooked or heated their home by burning biomass and fossil fuels, such as wood and coal. However, due to the harmful gases, such as nitrogen monoxide and formaldehyde produced during the combustion, as well as the particulate matter released during the process, long term exposed to an environment filled with harmful gases and inhalable particles would result respiratory symptoms over time, and aggravation of symptoms may lead to acute hospitalization. Most patients in the study were not aware of the impact on their health.

I did not use electricity in the past two years, and electricity was too expensive. My husband often smoked, and he used home-made tobacco, and I could not stand the smell. (A20)

I used to burn wood to cook and feed pigs, and there was no chimney in my kitchen, so I always opened the door when I cook. The development of the rural economy was sluggish, so we seldom used electronic power. (A16)

Disease Burden

Long term illness required significant medical expenditures. Due to the economic burden of the disease, patients may choose to invest less money in treatment, resulting in poor treatment effect and may lead to the onset of the disease.

I had applied for reimbursement policy successfully, but I still felt the economic burden was heavy. Because of the disease, I could not go out to work, so I had no income, just stayed in my hometown, and I had to spend money to buy medicine every month. (A12)

If the patient was the primary source of family income, it will bore the dual burden of disease and family.

I was diagnosed with silicosis at the age of 41, but I have been working all the time, because I had three children and the burden on me was very heavy. (A07)

Income Constrain

Family disposable income was one of the influencing factors of hospitalizations. The economic burden brought by disease treatment reduced the quality of life and disposable income of patients and their families. Patients were affected by the disease and left their jobs, resulting in a decrease in labor participation and productivity. Patients with low disposable income might miss the maintenance treatment for disease, due to inability to afford the medical costs, leading to utilization of inpatient services.

I have been ill for more than 10 years, and I could not do anything just stay at home. I had no financial resources. (A13)

Economic factors could also affected the living behaviors and medical choice. Due to income constrained and limited access to electricity resources, some rural patients still cooked by burning coal or wood.

I still burned wood, and the electricity was too expensive to use. The doctor asked me to transfer to a higher-level hospital, but I did not have any money. (A15)

Disease Perception

Disease perception referred to a person's awareness of the risk of developing a certain disease. If a person believed that they are more likely to develop a disease, they were more willing to take proactive actions to seek health care services. The patient stated that acute exacerbation caused by a cold, and worsening disease symptoms due to improper disease management and weak health awareness were the main reasons for the hospitalization.

The main reason why I came to the hospital this time was that I had a cold, with coughing and wheezing. I knew it would be troublesome if I did not press it down in time, so I came here for hospitalization treatment. (A01)

Negative Emotions

COPD was characterized by long-term, recurrent, and complex etiology, patients felt strongly dominated by the disease, and resulting negative emotions, which could also affect patients' motivation to treat the disease and their self-confidence.

At my age, it was useless to get medical treatment, it was a waste anyway. Many of my colleagues died, it was an occupational disease that hardly cured. Even if you had enough money, it could not be cured, one of my colleagues spent a lot of money on surgery, and finally, he died. (A09)

Comorbidity

The presence of comorbidities was common in COPD patients, but if comorbidities could not be identified in a timely manner, it had an impact on the diagnosis, treatment, and prognosis of patients.

My heart and cardiovascular problems also existed. One day I said to get the COVID-19 vaccine, and the doctor asked me if I had high blood pressure, I said I had high blood pressure, and the doctor would not let me get vaccinated. I also had osteoporosis. (A11)

Discussion

This study identified the factors associated with PPH for COPD patients in China using qualitative research method, based on twenty participants' experiences, which included environmental characteristics and personal characteristics. These findings are vital for providing valuable insights to reduce PPH and develop interventions.

Our study found that lack of healthcare resources and insufficient medical service capability in clinical practice fail to meet the needs of patients. This finding aligns with the result of Wang et al.²⁸ Chishui city, which was originally classified as a national poverty-stricken county and officially withdrew in October 2017, has seen significant improvement in economy and other areas. However, due to the limited development prospects, few medical professionals are willing to stay at the grassroots level. This observation is consistent with the existing studies, which suggests that medical professionals may be more inclined to practice in higher-level institutions and cities with better economic conditions.²⁹ Correspondingly, Li et al.³⁰ provide evidence indicating that medical staff at primary level in China have insufficient cognition of COPD, making them hardly to deal with patient emergencies. Our study also presented a negative example that expanding the outpatient benefit package can reduce PPH, which was proposed by Liu et al.³¹ In terms of patient experience, due to the limited population covered and reimbursement constraints of "Outpatient Chronic and Special Diseases" policy, patients' hospitalization behavior that could have been avoided through outpatient management. Furthermore, access to care has an impact on disease management, which also confirms the previous findings of our research team using quantitative methods in the same region,^{32,33} and this result may be attributed to the long distance from patients' residence to hospitals and inconvenient transportation services.

Our findings also showed that knowledge affects patient's work choice, disease cognition and health awareness indirectly affects medical behavior, which is consistent with most studies.^{34–37} First, patients in our study may be limited by education level, they prefer to choose jobs that do not require high education level, such as quarries and construction, and are at risk of occupational exposure. Studies have widely confirmed that occupational exposure to dust, gas, and fumes³⁸ and various organic particles³⁹ are associated with COPD. Second, disease cognition is affected by multiple factors. On the one hand, patients with high education pay more attention to their own health and are easier to understand disease and health-related knowledge. On the other hand, the number of acute attacks and disease severity are related to the disease cognition.⁴⁰ To reduce the number of hospitalizations and improve the quality of life, they may actively seek health information. Last, consistent with our findings, medication adherence and the use of solid fuels have proved to be associated with COPD hospitalizations.^{41–43} Possible reasons may be that most rural patients are influenced by their inherent beliefs, only take medicine once they experience recurrent cough, breathlessness, and other symptoms, and as patients age increase, cognitive function and memory decline, so they may forget to take medicine. In addition, most of

participants used to live in rural areas, they regard coal and wood as the main solid fuels,⁴⁴ and the cost of using electricity is more expensive. They are not aware of the harm of toxic gases from fuel combustion to the respiratory tract.

This study found that acute exacerbation caused by colds are the immediate reasons of PPH. This finding is consistent with the research by Tseng et al⁴⁵ and Johnston et al,⁴⁶ which reported that an over 30-fold increased risk of exacerbation when colds were present compared to cold-free periods. One possible explanation may be that most participants in the study are aged over 60, with deteriorated physiological functions, the risk of harmful effects of cold exposure increased.

Based on the research results, we suggest that improving accessibility of healthcare resources, enhancing the medical capability of medical professionals through further education and skill learning in higher-level healthcare institutions are needed. In addition, policy makers should consider the distance between patient's residence, transportation services, and healthcare providers when planning healthcare resources rationally, optimize spatial allocation of healthcare resources.^{47,48} Most importantly, healthcare professionals should focus on the education of patients and taking intervention, using the unique advantage of hospital wards to conduct lectures on disease cognition, rehabilitation and management, and establishing a connection between healthcare professionals and patients. It is worth mentioning that vaccination is currently an effective way to prevent colds and respiratory infections, which could also reduce the likelihood of deterioration in COPD patients.^{49–52} Therefore, for COPD patients, particularly the elderly, keeping warm and receiving vaccination annually should be recommended.

This study was designed and conducted following qualitative methodology, and it was the first article to explore the PPH-related factors from the patient perspectives in China. It was also added in-depth detailed information to the currently limited data on PPH-related factors for COPD. Compared to the quantitative method, focusing on the social and behavioral background context of patient experiences may help to explain the failure of disease management in preventing hospitalizations through interviews. Most importantly, many of the factors that patients self-reported, such as lack of knowledge and negative emotions, are unlikely to appear in the hospital administrative data. Although the saturation of sample information was achieved in the study, there are also some limitations. The face-to-face interviews were based on patients' self-reported experiences, and the recall of disease progression and hospitalization experiences may be affected by recall bias. In addition, the findings only represent the experiences of the study population, and the study should be replicated in different cities in the future. Given the inherent limitations of qualitative research, we will develop a questionnaire based on the results of this study in future research to further verify the relationship between these factors and PPH in a larger population.

Conclusion

Environmental characteristics and personal characteristics are factors associated with PPH, and in personal characteristics, disease perception is the immediate reason of PPH. The significant barriers of preventing PPH are patient cognition and accessibility of healthcare resources at primary level. Therefore, healthcare providers should teach patients the process of occurrence and development of the disease, how to respond when it occurs, relevant knowledge of health management, regularly follow-up to check patient's condition and medication, and make adjustment timely. Healthcare professionals should also improve the capability of clinical practice. By implementing these strategies, healthcare providers can better handle and manage patients with COPD at the primary level.

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Disclosure

The authors report no conflicts of interest in this work.

References

1. Agency for Healthcare Research and Quality. Prevention quality indicators. Available from: http://www.qualityindicators.ahrq.gov/modules/pqi_resources.aspx. Accessed June 5, 2023.

2. Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. *JAMA*. 1995;274(4):305–311. doi:10.1001/jama.1995.03530040033037
3. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease (2023 REPORT). Available from: <https://goldcopd.org>. Accessed June 5, 2023.
4. Lopez-Campos JL, Tan W, Soriano JB. Global burden of COPD. *Respirology*. 2016;21(1):14–23. doi:10.1111/resp.12660
5. Chen SM, Kuhn M, Prettnner K, et al. The global economic burden of chronic obstructive pulmonary disease for 204 countries and territories in 2020–50: a health-augmented macroeconomic modelling study. *Lancet Glob Health*. 2023;11(8):e1183–e1193. doi:10.1016/S2214-109X(23)00217-6
6. Expert group on management of acute exacerbation of chronic obstructive pulmonary disease. Expert consensus on acute exacerbation of chronic obstructive pulmonary disease in the People's Republic of China (revision in 2023). *Int J Respir*. 2023;43(2):132–149. doi:10.3760/cma.j.cn131368-20221123-01066
7. Zhu B, Wang Y, Ming J, et al. Disease burden of COPD in China: a systematic review. *Int J Chron Obstruct Pulmon Dis*. 2018;13:1353–1364. doi:10.2147/COPD.S161555
8. Nyweide DJ, Anthony DL, Bynum JPW, et al. Continuity of care and the risk of preventable hospitalization in older adults. *JAMA Intern Med*. 2013;173(20):1879–1885. doi:10.1001/jamainternmed.2013.10059
9. Rizza P, Bianco A, Pavia M, et al. Preventable hospitalization and access to primary health care in an area of southern Italy. *BMC Health Serv Res*. 2007;7:134. doi:10.1186/1472-6963-7-134
10. Paul MC, Dik JWH, Hoekstra T, et al. Admissions for ambulatory care sensitive conditions: a national observational study in the general and COPD population. *Eur J Public Health*. 2019;29(2):213–219. doi:10.1093/eurpub/cky182
11. Quinn N, Gupta N. Income inequalities in the risk of potentially avoidable hospitalization and readmission for chronic obstructive pulmonary disease: a population data linkage analysis. *Int J Popul Data Sci*. 2020;5(1). doi:10.23889/ijpds.v5i3.1388
12. Botelho JF, Portela MC. Risk of misinterpretation of trends in hospital admissions for primary care sensitive conditions in local contexts: itaborai, Rio de Janeiro State, Brazil, 2006–2011. *Cadernos De Saude Publica*. 2017;33(3). doi:10.1590/0102-311X00050915
13. Thygesen LC, Christiansen T, Garcia-Armesto S, et al. Potentially avoidable hospitalizations in five European countries in 2009 and time trends from 2002 to 2009 based on administrative data. *Euro J Public Health*. 2015;25:35–43. doi:10.1093/eurpub/cku227
14. Van Der Pol M, Olajide D, Dushenko M, et al. The impact of quality and accessibility of primary care on emergency admissions for a range of chronic ambulatory care sensitive conditions (ACSCs) in Scotland: longitudinal analysis. *BMC Fam Pract*. 2019;20. doi:10.1186/s12875-019-0921-z
15. Laditka JN, Laditka SB. Race, ethnicity and hospitalization for six chronic ambulatory care sensitive conditions in the USA. *Ethnicity Health*. 2006;11(3):247–263. doi:10.1080/13557850600565640
16. Howard DL, Hakeem FB, Njue C, et al. Racially disproportionate admission rates for ambulatory care sensitive conditions in North Carolina. *Public Health Rep*. 2007;122(3):362–372. doi:10.1177/003335490712200310
17. Trachtenberg AJ, Dik N, Chateau D, et al. Inequities in ambulatory care and the relationship between socioeconomic status and respiratory hospitalizations: a population-based study of a Canadian City. *Ann Fam Med*. 2014;12:402–407. doi:10.1370/afm.1683
18. Bindman AB, Chattopadhyay A, Auerback GM. Interruptions in Medicaid coverage and risk for hospitalization for ambulatory care-sensitive conditions. *Ann Intern Med*. 2008;149(12):854. doi:10.7326/0003-4819-149-12-200812160-00004
19. Bergamo C, Juarez Colunga E, Capp R. Association of mental health disorders and Medicaid with ED admissions for ambulatory care-sensitive condition conditions. *Am J Emerg Med*. 2016;34(5):820–824. doi:10.1016/j.ajem.2016.01.023
20. Wood SM, Yue ML, Kotsis SV, et al. Preventable hospitalization trends before and after the affordable care act. *AJPM Focus*. 2022;100027. doi:10.1016/j.focus.2022.100027
21. Marques AP, Montilla DER, Almeida WD, et al. Hospitalization of older adults due to ambulatory care sensitive conditions. *Rev Saude Publica*. 2014;48:817–826. doi:10.1590/S0034-8910.2014048005133
22. Lin IP, Wu SC. Effects of long-term high continuity of care on avoidable hospitalizations of chronic obstructive pulmonary disease patients. *Health Policy*. 2017;121(9):1001–1007. doi:10.1016/j.healthpol.2017.06.010
23. Zhao X, Zhang Y, Yang Y, et al. Diabetes-related avoidable hospitalizations and its relationship with primary health care resourcing in China: a cross-sectional study from Sichuan Province. *Health Soc Care Comm*. 2022;30:e1143–e1156. doi:10.1111/hsc.13522
24. O'malley AS, Pham HH, Schrag D, et al. Potentially avoidable hospitalizations for COPD and pneumonia – the role of physician and practice characteristics. *Med Care*. 2007;45(6):562–570. doi:10.1097/MLR.0b013e3180408df8
25. Chen S, Fu H, Jian W. Trends in avoidable hospitalizations in a developed city in eastern China: 2015 to 2018. *BMC Health Serv Res*. 2022;22:856. doi:10.1186/s12913-022-08275-w
26. Wang X, Yang H, Duan Z, et al. Spatial accessibility of primary health care in China: a case study in Sichuan Province. *Soc Sci Med*. 2018;209:14–24. doi:10.1016/j.socscimed.2018.05.023
27. Braun V, Clarke V. Conceptual and design thinking for thematic analysis, qualitative. *Psychology*. 2022;9(1):3. doi:10.1037/qup0000196
28. Wang GR, Jiang M, Tong XH, et al. Situation analysis of township health workers in poor rural counties. *Chin Primary Health Care*. 2002;5:27–29.
29. Meng Q, Yuan J, Jing L, et al. Mobility of primary health care workers in China. *Hum Resour Health*. 2009;7:24. doi:10.1186/1478-4491-7-24
30. Li S, Jia C, Fang F, et al. Investigation on cognition of chronic obstructive pulmonary disease(COPD) among doctors in 18 areas of China. *Chin J Health Educ*. 2020;36(3):195–199. doi:10.16168/j.cnki.issn.1002-9982.2020.03.001
31. Liu HR, Chen SY, Zhang LY, et al. Expanding outpatient benefits package can reduce diabetes-related avoidable hospitalizations. *Front Public Health*. 2023;11:964789. doi:10.3389/fpubh.2023.964789
32. Chen T, Pan J. The effect of spatial access to primary care on potentially avoidable hospitalizations of the elderly: evidence from Chishui City, China. *Soc Indic Res*. 2022;160:645–665. doi:10.1007/s11205-020-02413-9
33. Chen L, Chen T, Lan T, et al. The contributions of population distribution, healthcare resourcing, and transportation infrastructure to spatial accessibility of health care. *INQUIRY J Health Car*. 2023;60. doi:10.1177/00469580221146041
34. Wang R, Zhang W, Li Y, et al. Evaluation of risk factors for chronic obstructive pulmonary disease in the middle-aged and elderly rural population of northeast China using logistic regression and principal component analysis. *Risk Manag Healthc Policy*. 2022;15:1717–1726. doi:10.2147/RMHP.S376546
35. Tiemensma J, Gaab E, Voorhaar M, et al. Illness perceptions and coping determine quality of life in COPD patients. *Int J Chron Obstruct Pulmon Dis*. 2016;11:2001–2007. doi:10.2147/COPD.S109227

36. Antoniu SA. Adherence to inhaled therapy in COPD: effects on survival and exacerbations. *Expert Rev Pharmacoecon Outcomes Res.* **2010**;10:115–117. doi:10.1586/erp.10.10
37. Gershon AS, Warner L, Cascagnette P, et al. Lifetime risk of developing chronic obstructive pulmonary disease: a longitudinal population study. *Lancet.* **2011**;378(9795):991–996. doi:10.1016/S0140-6736(11)60990-2
38. Mehta AJ, Miedinger D, Keidel D, et al. Occupational exposure to dusts, gases, and fumes and incidence of chronic obstructive pulmonary disease in the Swiss Cohort study on air pollution and lung and heart diseases in adults. *Am J Respir Crit Care Med.* **2012**;185:1292–1300. doi:10.1164/rccm.201110-1917OC
39. Grahn K, Gustavsson P, Andersson T, et al. Occupational exposure to particles and increased risk of developing chronic obstructive pulmonary disease (COPD): a population-based cohort study in Stockholm, Sweden. *Environ Res.* **2021**;200:111739. doi:10.1016/j.envres.2021.111739
40. Baiardini I, Rogliani P, Santus P, et al. Disease awareness in patients with COPD: measurement and extent. *Int J Chron Obstruct Pulmon Dis.* **2018**;14(17):1–11. doi:10.2147/COPD.S179784
41. Chan KH, Kurmi OP, Bennett DA, et al. Solid fuel use and risks of respiratory diseases. A cohort study of 280,000 Chinese never-smokers. *Am J Respir Crit Care Med.* **2019**;199(3):352–361. doi:10.1164/rccm.201803-0432OC
42. Raju S, Keet CA, Paulin LM, et al. Rural residence and poverty are independent risk factors for chronic obstructive pulmonary disease in the United States. *Am J Respir Crit Care Med.* **2019**;199(8):961–969. doi:10.1164/rccm.201905-0974LE
43. Li J, Qin C, Lv J, et al. Solid fuel use and incident COPD in Chinese adults: findings from the China Kadoorie Biobank. *Environ Health Perspect.* **2019**;127(5):57008. doi:10.1289/EHP2856
44. Tang X, Liao H. Energy poverty and solid fuels use in rural China: analysis based on national population census. *Energy Sustain Dev.* **2014**;23:122–129. doi:10.1016/j.esd.2014.08.006
45. Tseng CM, Chen YT, Ou SM, et al. The effect of cold temperature on increased exacerbation of chronic obstructive pulmonary disease: a nationwide study. *PLoS One.* **2013**;8:e57066. doi:10.1371/journal.pone.0057066
46. Johnston NW, Olsson M, Edsbacker S, et al. Colds as predictors of the onset and severity of COPD exacerbations. *Int J Chron Obstruct Pulmon Dis.* **2017**;12:839–848. doi:10.2147/COPD.S127146
47. Pan J, Deng Y, Yang Y, et al. Location-allocation modelling for rational health planning: applying a two-step optimization approach to evaluate the spatial accessibility improvement of newly added tertiary hospitals in a metropolitan city of China. *Soc Sci Med.* **2023**;338:116296. doi:10.1016/j.socscimed.2023.116296
48. Zhang Y, Yang H, Pan J. Gaining from rational health planning: spatial reallocation of top-tier general hospital beds in China. *Comput Ind Eng.* **2021**;157:107344. doi:10.1016/j.cie.2021.107344
49. British Thoracic Society. IMPRESS guide to the relative value of COPD interventions. British Thoracic Society Reports, **2012**. Available from: <https://www.networks.nhs.uk/nhs-networks/impressimproving-and-integrating-respiratory>. Accessed June 5, 2023.
50. Poole PJ, Chacko E, Wood-Baker RW, et al. Influenza vaccine for patients with chronic obstructive pulmonary disease. *Cochrane Database Syst Rev.* **2006**;1:CD002733. doi:10.1002/14651858.CD002733.pub2
51. Walters JA, Tang JN, Poole P, et al. Pneumococcal vaccines for preventing pneumonia in chronic obstructive pulmonary disease. *Cochrane Database Syst Rev.* **2017**;1:CD001390. doi:10.1002/14651858.CD001390.pub4
52. Wongsurakiat P, Maranetra KN, Wasi C, et al. Acute respiratory illness in patients with COPD and the effectiveness of influenza vaccination: a randomized controlled study. *Chest.* **2004**;125:2011–2020. doi:10.1378/chest.125.6.2011

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