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Barriers to standardized inhaler use among COPD patients in rural China: a qualitative study on patient perspectives

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Abstract

Background

Chronic obstructive pulmonary disease (COPD) is a serious illness with high mortality and complication rates. Inhaler is the primary treatment for COPD. However, its benefit will be diminished if patients misuse them, particularly in rural regions with few medical resources. Most studies focus on urban patients, lacking attention on the specific barriers faced by rural Chinese COPD patients. This study aims to explore the barriers to the use of inhalers among rural COPD patients in China.

Methods

A descriptive qualitative research method was adopted to conduct semi-structured interviews with 14 stable COPD patients in rural Chinese from August to October 2025. The Social-Ecological model was used to extract themes through directed content analysis.

Results

A total of 5 themes and 12 sub-themes were extracted, including six sub-themes at the individual level, one at the interpersonal level, two at the organizational level, one at the community level, and two at the policy level.

Conclusions

Barriers to standardized inhaler use among rural COPD patients are multi-leveled and interrelated at the individual, interpersonal, organizational, community, and policy levels.

Background

Chronic obstructive pulmonary disease(COPD) is a common chronic condition characterized by persistent respiratory symptoms and airflow limitation. Due to its high mortality, disability, and prevalence rates, it is becoming a significant global public health concern(World Health Organization. 2025). Around 100 million people in China are suffering from COPD, 59.7 million of them live in rural areas, and its prevalence rate stands at 9.6% in rural areas, higher than the 7.4% in urban areas, revealing a significant urban-rural disparity(Baldomero et al. 2023; Wang et al. 2018). For stable COPD patients, pre-filled, portable inhalers are more convenient for use outside the hospital. The inhalers enable targeted medication delivery and a rapid onset of action, which helps relieve COPD symptoms, reduce acute exacerbations, and improve patients' quality of life(Bourbeau et al. 2023; Chinese Medical Association et al. 2024; Global Initiative for Chronic Obstructive Lung Disease. 2025). However, it is worth noting that less than half of patients are able to use it correctly, and the rate of correct usage has shown little improvement over the past 40 years(Dean Hess, Rajiv Dhand. 2025). Wu et al. (2024)found that the rate of poor inhaled medication adherence among rural Chinese patients was 69.9%, higher than the 60.6% rate in urban areas, identifying rural residence as an risk factor for poor inhaled medication adherence. Most studies currently focus on the accuracy of inhalation techniques or medication adherence among urban patients. Rural patients outnumber urban patients and bear a heavier disease burden. However, rural patients receive far less attention and support when using inhalers(Janjua et al. 2021; Wu et al. 2024). Thus, it is imperative to conduct a study on the barriers to the use of inhalers by rural Chinese patients with COPD. This qualitative study adopts the perspective of rural Chinese patients with stable COPD to analyze the barriers affecting inhaler use, aiming to provide theoretical foundations and practical guidance for developing targeted intervention strategies.

Methods

Study Design

This study employs a descriptive qualitative research design. Based on a review of the relevant literature, the research team initially formulated an interview outline through discussion and conducted a pre-interview with two rural Chinese patients with COPD who

met the inclusion and exclusion criteria. The final interview outline was based on pre-interview results and expert input (see Supplemental Material 1). It remained open-ended to capture authentic experiences and avoid theoretical constraints. Data analysis used the Social-Ecological Model to categorize interview data into five levels: individual, interpersonal, organizational, community, and policy. The Consolidated Criteria for Reporting Qualitative Studies (COREQ) checklist(Tong et al. 2007) was used to inform the reporting of this study.

Setting and Sample

Using the purposive sampling method, patients with COPD from rural Chinese areas who visited a hospital in China from August to October 2025 were selected as participants. Inclusion criteria were: i) Age ≥ 18 years, ii) Patients diagnosed with chronic obstructive pulmonary disease in the stable phase(Chinese Medical Association et al. 2024; Global Initiative for Chronic Obstructive Lung Disease. 2025), iii) At least one inhalation device has been used, iv) Rural household registration and continuous residence in a rural area for the past six months, v) Possesses sound cognitive abilities and can communicate effectively, vi) Informed consent and voluntary participation in this study. Exclusion Criteria: i) Concurrent tumors and severe primary diseases and complications in other systems; ii) Individuals with impaired consciousness or mental illness. iii) Patients participating in a clinical trial of the drug.

Data collection

Semi-structured interviews were used in this investigation. With assistance from ward nurses, researchers contacted selected patients and established trust through daily activities. After informed consent, individual interviews were held in a quiet study room and audio-recorded. Interview topics were flexible and not restricted to an outline. Interviewers followed up immediately on patients' responses to clarify or confirm details, taking note of their body language and facial expressions. Each interview lasted 30 to 45 minutes. During the interview, the interviewer neither guided nor summarized the participants' statements. According to the principle of sample selection, the interview was terminated when no new themes emerged, indicating information saturation(Baker, Edwards, 2012).

Data Analyze

Within 24 hours after the interview, the interviewer transcribed it verbatim and imported the text into NVivo15.0 for analysis. The Social-Ecological Model (McLeroy et al. 1988) indicates that human health is influenced not only by individual attributes and behaviors but also by ecological factors such as the environment. This framework helps clarify the multi-level factors driving health behaviors in rural patients. Based on this, data were analyzed with directional content analysis in descriptive research(Elo, Kyngäs. 2008): (i) Review the transcript several times to grasp main points. (ii) Open code and analyze line by line for key assertions. (iii) Organize themes by the five levels of the Social-Ecological Model: individual, interpersonal, organizational, community, and policy. (iv) Link topics to form theme clusters. (v) Continue until no new themes emerge. To substitute personal identification in records and analysis, each participant was given a unique code (e.g., P1, P2). Interview-related incidental third-party data will be anonymised before analysis. Raw data is only accessible to the research team.

Rigor

(i) Researchers have received systematic training in qualitative research methodologies to ensure the standardization and rigor in the interview process. (ii) Two researchers participated in participants’ clinical care and nursing to build trust and collect data. (iii) Researchers refrained from personal comments or judgments during the interview process, and flexibly adjusted the interview outline’s order in response to the subjects' immediate feedback. (iv) During data analysis, researchers set aside personal biases and reviewed data repeatedly to avoid influencing interpretation.

Result

Characteristics of participants

A total of 14 patients (coded P1 to P14) were included in this study. The cohort was predominantly male, with a mean age of 72 years (range: 57 ~ 83). All patients resided in rural areas, with most having an educational attainment of elementary school or below (11/14). Except for one widower, all were married. Over half were farmers living with their spouses and had the Urban and Rural Residents' Medical Insurance. Most patients had a disease duration exceeding five years. Inhaler usage ranged from 20 days to over 10 years. Medications types included triple combinations (Breztri®, Trelegy Ellipta®, Ultibro Breezhaler®), dual combinations (Symbicort®, Seretide®, Anoro Ellipta®), and short-acting bronchodilators (Ventolin®). Among these, Breztri was the most commonly used (7 cases), followed by Trelegy Ellipta (4 cases) and Seretide (3 cases). Detailed general information is presented in Table 1.

Table 1.

Demographic and Clinical Characteristics of the Study Participants (n = 14)

ID	Age	Inhaled Medication(s)	Disease Duration (years)	Duration of inhaler use	Marital Status	Occupation	Living Arrangement	Health Insurance
p1	78	Breztri®[a]	8	>2 years	Widowed	Farmer	With children	URRMI
p2	75	Trelegy Ellipta® [b]	3	>1 month	Married	Farmer	With spouse	RCMS
p3	83	Trelegy Ellipta®	2	>20 days	Married	Farmer	Alone	URRMI
p4	71	Ventolin®[c] , Bevespi®	2	>16 days	Married	Farmer	With spouse	URRMI
p5	72	Seretide® [d]	3	>3 years	Married	Unemployed	With children	URRMI
p6	74	Ventolin®	4	>1 year	Married	Unemployed	With spouse	URRMI
p7	74	Seretide®	13	>10 years	Married	Farmer	With spouse	URRMI
p8	57	Anoro Ellipta® [e] Breztri®, Trelegy Ellipta®, Symbicort® [f]	30	>10 years	Married	Farmer	Alone	URRMI
p9	74	Ventolin® Anoro Ellipta®	40	>2 years	Married	Farmer	With spouse	URRMI
p10	77	Seretide®, Breztri®,	8	>3 years	Married	Farmer	With spouse	URRMI
p11	74	Breztri®, Trelegy Ellipta®	8	>1 year	Married	Farmer	With spouse	URRMI
p12	76	Ultibro Breezhaler® [g]	15	>6 years	Married	Worker	With children	URRMI
p13	68	Breztri®	12	>1 month	Married	Farmer	Alone	RCMS
p14	69	Breztri®	4	>1 year	Married	Farmer	With spouse	URRMI

Notes: [a]Breztri®, Glycopyrronium/Budesonide/Formoterol;

[b]Trelegy Ellipta®, Fluticasone/Umeclidinium/Vilanterol;

[c]Ventolin®, Salbutamol;

[d]Seretide®, Salmeterol/Fluticasone;

[e]Anoro Ellipta®, Umeclidinium/Vilanterol;

[f]Symbicort®, Budesonide/Formoterol;

[g]Ultibro Breezhaler®, Indacaterol/Glycopyrronium;

URRMI, Urban-Rural Resident Medical Insurance; RCMS, Rural Cooperative Medical Scheme.

Based on the Social-Ecological Model, five themes—individual, interpersonal, organizational, community, and policy levels—were identified, along with 12 sub-themes under these themes.

Individual level

Misconceptions about diseases and medication

In the treatment of COPD, participants generally lack awareness of the disease, and most believe it can be cured, which affects adherence to inhaled medication. P1: My condition stemmed from catching colds. Whenever I caught a cold, I started coughing. When I caught like this, my heart raced, and I felt exhausted. P6: All I know is I'm exhausted, but I don't know what's wrong with me. I just don't know if this exhaustion can even be cured. P7: I don't know what's wrong with me either. I just felt tired, but I didn't cough. P14: We are from the countryside. I really wish to come here (to the hospital), where can help me recover, and then I'll be able to leave.

Rural Chinese COPD patients often misunderstand how inhaled medications work and how they should be used. Many view inhalers solely as a means to relieve symptoms, rather than as maintenance treatments. As a result, inhaler use tends to be limited to moments when symptoms are severe, reflecting a lack of awareness about the need for consistent, long-term use. These makes it difficult for patients to adhere to and autonomously adjust their medication schedules. P2: What part of the body is this (inhalant) meant to treat? Is it for the lungs? P6: Anyway, after working hard and getting exhausted, I'd sit down and inhale the medicine for a while. P12: I didn't have a fixed time for taking the medicine. Sometimes I take it earlier, sometimes later, but usually in the morning. Sometimes I remember to take it after having breakfast because I'm active during the day, and getting active makes me tired. If I take it in the morning, I can stay comfortable for the whole day. If I take it in the afternoon, the effect may still be present, but the effect is minimal when it comes to sleep at night. P14: The inhaler can be used anytime. I used it whenever I felt tired or short of breath, just like using this oxygen tank. When I got home and the symptoms eased up, I forgot about it. But when they flared up again, I remembered to take my medicine.

Insufficient ability to access health information

Rural COPD patients commonly face the dilemma of having a strong need for health information but being unable to independently search for and obtain it due to capacity limitations. This issue is primarily manifested in low educational attainment or literacy difficulties, declining vision that prevents reading instructions, and a lack of access to and the ability to actively seek health information. P2: So what's this inhaler even for? The instructions are written in such tiny print, I can't even make out the words. P4: I never went to school, can't read much, and can't make out the writing. How am I supposed to figure it out? P11: It's not that I don't want to adjust it. I want to adjust it myself, but I don't know how to adjust it. I couldn't adjust it. There's nothing I could do.
The patient adjust the medication according to their own wishes.

Our participants often struggle to remember the steps when using inhalers. As a result, they make decisions on their own regarding the way, timing, or dosage of medication, without strictly following the doctor's instructions. This leads to the omission of key steps. P11: I remembered just breathing in, but I couldn't recall the rest. It indicates that the patient has a limited memory capacity, and the execution of the operation is not standardized. P8: What I did was to press this button, and once it's activated, I started inhaling. Just take a hit and then leave him alone. Whether to hold my breath or not, it didn't really matter. I also can't remember the dosage. Anyway, I'm just a chronic sufferer. For me, I'm satisfied as long as it works. P7: The doctor taught me once,to open it, inhale, and then close it—that's all. P14: Regarding inhalers, I didn't really have a specific (standard) usage (as per the guidelines). I had my own way. To be honest, I hadn't even taken into account the standard procedures for inhalation medication.

Insufficient self-monitoring and evaluation capabilities

Rural patients frequently fail to establish regular medication habits and are prone to forgetting dosages due to the hard nature of farm work. Reduced treatment adherence results from their inability to quickly identify instances of treatment interruption or non-compliance due to their lack of understanding of standardized medication practices. P12: I just forgot. Sometimes, like when it was time to take it, something came up, and I got sidetracked. Then later, I couldn't remember. Medication habits aren't integrated into daily routine, making it hard to form a solid habit. p14: Well, it's like this—when we fed the pigs and stuff, we usually just did it here and there. Sometimes we remembered to take the medicine, sometimes we just forgot. P1: I didn't do that(Holding a breath). I just inhaled, rinsed it out, and threw it away. I suppose it was like inhaling a little bit, then it just rushed out and was discarded. Oh, I don't know if that was correct or not. It doesn't matter much anyway. P4: Oh well, whether it's right or wrong doesn't matter anyway—it doesn't make a difference whether you use it or not. P8 failed to recognize the errors in their medication regimen and instead blindly affirmed it, leading to non-standardized use: I just took it according to my own principles—basically, I inhaled it when I felt an episode coming on. What I was doing must be right.

Insufficient perceived benefits of medication

Most participants reported not experiencing noticeable symptom improvement in the short term, which led them to doubt the inhaled treatment and discontinue its use. P10: The doctor said I needed to take it long-term, but I just can’t keep up with it. Others buy the same medicine, and it works for them, but when I tried it, it didn’t help. It just doesn't work, so I don't believe in this medicine, and I don't want to use it. P11: That's when I got the inhaler in July, tried it, and stopped using it myself after feeling it didn't work. P13: That spray inhaler didn't do much. Since it didn't seem effective, I didn't take it seriously and stopped using it. P14: I used the inhaler before. Back then, I didn't feel it had much effect. Tried it two or three times, but honestly, it didn't do anything.

It is noteworthy that some participants compare inhaled therapy with acute treatments such as oral medications and intravenous infusions. Due to the perception that inhaled medication are less effective than oral medications or intravenous fluid administration, coupled with the need for frequent administration of smaller doses, patients ultimately choose to discontinue regular use of inhalers. P4: I didn't keep using it (the inhaler). The one he got only lasted for half a month. Oh well, just take some medicine. Getting some medicine or intravenous fluid administration is better anyway. P14: Don't bother with that (inhaler), it's too much trouble. Just take some medicine. Honestly, the inhaler doesn't work that well.

Low treatment self-efficacy

Some participants showed a lack of intrinsic motivation for treatment, adopting a negative, passive, and fatalistic attitude towards the disease and the treatment process, which made it difficult to establish a consistent medication habit. P11: I never paid attention to any of the treatment. Anyway, the doctor prescribed whatever medicine, I just took it. It was like having meals, I didn't eat it if I didn't want to. I didn't inhale it if I didn't want to. P14 revealed a strong sense of pessimism and resignation: There's a local clinic in town, so I just went there occasionally for treatment. If this illness kills me, so be it; if I live, I live. If it can't be cured, I'll just pass away. Even with daily meals, I don't really care whether I eat or not. P12 viewed COPD as an inevitable consequence of aging, downplaying the need for treatment: As people get older, it's like machines—their physical functions decline in various way. I may not be well-educated, but I do understand some things. After all, when you're old, you're bound to get sick. I don't carry any mental burden about illness, I'm quite peaceful.

Interpersonal level

Limited family support

Most participants live with their children in rural areas of China. It shows that younger family members could help them acquire knowledge about diseases and inhaler technology to some extent. However, a lack of professionalism and discontinuity in their help poses a significant problem for rural patients. Moreover, there are still some participants who live alone or with older spouses who cannot offer supervision and guidance. P12: The medical staff gave me some unopened bottles and suggested I seek help from younger people. They just glance at the instructions and know what to do. Like with my son—I'd buy the medicine and bring it home, show him the instructions, and he'd teach me how to use it. During the day, they'd go to work, and when I was home alone with nothing to do, I'd take out the medicine and inhale it. P11: We live in the countryside, quite far away. Usually, my children help me get my medicine; I haven't come myself." P10: Usually, it's my daughter who helps me get the medication. My son works away from home. If I had any questions, I either went to the hospital to find out or I talked to my daughter about it.

As stated, some participants' children work away from home, making it difficult for them to receive assistance and supervision from family members when they are using the inhaler. Consequently, these patients often struggled to adhere to the use of inhalers. P2: I bought (the inhaler) but didn't use it. I live with my wife, and our son runs a business in another city. Neither of us can understand how to use these things. P13: I live alone. Sometimes my grandson came back. He can read the instructions and understand how to get it and spray it. So he taught me to take twice. Later, when I tried it on my own, it didn't work. Then I just stopped using it.

Organizational level

Lack of initial medication guidance

When taking inhalers for the first time, several participants reported not receiving sufficient or uniform information on inhaler. They emphasized two key reasons: First, healthcare facilities often fail to provide expert advice to first-time inhaler users when individuals seek medical attention. Second, medical personnel are often unable to provide patients with on-site explanations when their children pick up their medicines on their behalf. P2: I purchased it (the inhaler)but did not use—I have no idea how to use it. I don't know how, and the doctor never explained it to me. P13: When I picked up the medication, no one talked to me about how to use it. They just handed it to me, and I took it home. Once I got back, I didn't even know how to get the medication out. If I knew how to use it, of course, I would do. P1: My son, a young guy of the family, bought this for me. But I didn't see any instructions on how to use it, so I never learned.

Absence of long-term follow-up and support mechanisms

Most participants claimed that they didn’t receive professional medical assistance or post-discharge follow-up. One-time, quick medication instructions may not align with patients' actual understanding and practical aptitude, leading to difficulties in converting the knowledge guidance into long-term and stable skills. P11: The doctor only showed me how to use it that one time. I got the medicine and left. There was no check if I was doing it correctly. P14: I didn't exhale first. Was I supposed to exhale? Ah, he did teach me, but I forgot that part." P4: When I got the inhaler prescribed at the hospital, they did show me how to use it. But after I returned home, I forgot the steps. It only lasted for about ten days.Well, I don't use it now. What's the point of them dispensing such a small amount each time?

Community level

Poor geographic accessibility

Participants' homes and medical facilities are often geographically far apart, making transportation difficult. Additionally, travel-related fatigue frequently exacerbates symptoms like breathing difficulties in patients, making it more challenging for them to access medical services and medications, decreasing their willingness to seek treatment, and ultimately affecting their treatment adherence. P4: I don't want to go to the hospital to ask for some thing. I live too far away, and the exhaustion from the trip would trigger my coughing. P10: I live deep in a mountain valley, quite remote. It's very inconvenient to get to the hospital. P11: Getting medication is truly troublesome. I live out with my spouse in the countryside, and it's quite a distance. P12: I've been using inhalers for a year or two now, and it's always a hassle to go buy them. Every time I come to buy one, I have to come in person, delaying my work and adding up the money for transportation each time.

Policy level

Inadequate accessibility to medicines at the primary care level

The inhalation medications are ineffective and have lower dosages at the primary care level, which prevents them from meeting patients' ongoing treatment needs. Patients can only obtain the medication at higher-level medical institutions, which increases their difficulty in accessing the inhaler and their financial burden. These might be a physical barrier that affects patients' medication adherence. P12: For a while, I used a different round-box version prescribed at a township hospital, but it wasn't as effective as the one from the major hospital. However, it's always a hassle to get this medication—it's unavailable at the county hospital and only available at this major hospital. P14: The one I used before was from a rural clinic. It was a small-dose inhaler that only lasted for one or two uses. The inhaler from this major hospital, for example, you can see how much medication is left—it has an indicator, which is much better. But you can't get this type at the township-level clinics.

High inhaler costs and inadequate primary insurance protection

Participants generally reported that the cost of the inhaler was high, imposing a significant financial burden. Moreover, the medical insurance coverage for obtaining the medicine at the outpatient clinic was insufficient, failing to provide adequate cost relief. As a result, patients often reduced the dosage or purchased cheaper but less effective alternatives to address expenses. P12: The inhaler I'm using now works well, but it's expensive—three hundred yuan per vial. Even with insurance coverage, the outpatient insurance reimbursement amount is minimal. It can only get substantial reimbursement when hospitalized. With our resident medical insurance, the outpatient coverage limit is insufficient to cover even one dose. Later, I discovered it's available on JD.com, so I went online to buy the medicine. P6: I bought mine at a small clinic—it's cheaper. I just followed the instructions. That is, open it up, take a sniff, and then inhale. P7: The doctor did explain how to use it properly, but I only used one dose a day. The medication is quite expensive, so I only inhaled it when I feel wheezy or short of breath. If I felt no tired, I didn't use it at all.

For some rural Chinese patient who seek medical care outside of their home region, in addition to paying more for transportation, they may also have reduced reimbursement rates or no coverage at all, which adds to their financial burden. P14: We're from a rural area and were referred here from another region. So we didn't get much reimbursement, no pension either—nothing at all. I just hope to be discharged as early as possible.

Discussion

This qualitative study investigates the barriers to standardized inhaler use among patients with COPD in rural China. The study reveals that the complex interaction among factors such as patients' limited cognition in inhalation therapy and disease, weak social support, insufficient basic medical resources and service capabilities, and inadequate coverage of social medical insurance policies, all contribute to or exacerbate the non-standardized inhaler use by rural Chinese patients with COPD.

Personalized inhalation guidance: education, skill-building, and psychological support

This study found that insufficient understanding of diseases and inhalation therapy might be the main reason why COPD patients in rural Chinese areas have a skeptical attitude towards inhalation treatment. Many patients perceive COPD as a curable acute condition, while failing to fully recognize that inhaled therapy requires long-term standardized administration to achieve efficacy. This cognitive bias makes it difficult for patients to perceive therapeutic effects in the short term, thereby diminishing their motivation to use inhalers consistently, which aligns with the findings of Yadav et al. (2020). Meanwhile, there is a lack of systematic and continuous professional guidance for rural Chinese patients, resulting in insufficient capacity for patients to use and manage inhalers, consistent with the findings of Halding et al. (2018) and O'Toole et al. (2022). However, due to factors such as geographical isolation, inconvenient transportation, and economic pressure, it is challenging to promote the traditional face-to-face education model widely in rural China. Aung et al. (2024) proposed promoting the deep integration of basic education and digital technology. Platforms like WeChat can be utilized to develop remote guidance systems for inhaled medications, enabling patients to view instructional videos and receive personalized feedback repeatedly. Press et al. (2020) have confirmed that virtual "teach-to-goal" education is as effective as face-to-face education. Additionally, COPD patients can become significantly more motivated and involved in their studies when instruction is combined with gamification, thereby enhancing medication adherence and refining inhalation techniques(Xiting Huang. 2025). While enhancing patients' capabilities, special attention should be paid to their psychological well-being. A tiered psychological support network centered on village doctors could be established, conducting regular follow-ups to provide tailored psychological assistance, such as mindfulness training and self-affirmation techniques, to help alleviate patients' anxiety about their illness(Chen et al. 2025). Addressing issues such as timing confusion, medication inertia, and forgetfulness in the use of inhalers among rural Chinese patients, targeted reminder measures should be implemented. For instance, implementing intention-to-act behavior change techniques to naturally link medication-taking with daily activities such as “after meals” or “before bedtime”(Pirolli et al. 2017; Prestwich, Kellar. 2014). To improve the regularity and efficacy of patients' medication management, put huge posters in high-frequency places like kitchens and bedrooms, set up audio reminders on mobile phones, and create a "medication check-in chart".

Family - community synergy: activating support systems to reinforce inhaler management

The findings show that family support serves as a crucial social foundation for the standardized inhaler use in rural Chinese patients with COPD, although its impact is twofold. Family members can provide both emotional support and oversight, but may also offer poor advice because they lack the requisite knowledge, which aligns with the findings of Pendoni et al. (2024). Therefore, to guide family support in playing a positive role, it is essential to establish a multi-tiered support system.(Zhan et al. 2019). First, family members should be encouraged to receive synchronous training. Medical staff should provide tailored guidance based on their cognitive level through a combination of online and offline methods, thereby enhancing their comprehension of the illness and medication, and enabling them to support the treatment process effectively. Second, by empowering communities, we can compensate for the lack of professional resources in remote areas by mobilizing key figures like village doctors and village cadres, training them to use basic guidance skills for inhalation agents, routinely following up with patients by phone, and teaching family members how to supervise medication effectively(Schwarz et al. 2020). Additionally, we should make the best use of community networks in rural China to establish village-level" COPD mutual support groups" and WeChat group chats, regularly organizing patient exchange meetings to share medication experiences and foster a sustainable support environment.

Advocating for social justice in COPD care: modifying insurance, resource allocation, and clinical practice

The study(Williams et al. 2024) indicates that COPD reflects social structural injustice rather than being merely an individual health issue. The multiple challenges exhibited in this study regarding the use of inhalers by rural Chinese COPD patients—such as heavy economic burden, medication accessibility, and insufficient professional care—are concrete manifestations of this structural injustice, which severely undermines the treatment quality of rural COPD patients(Baldomero et al. 2023). Specifically, on the one hand, rural Chinese COPD patients notice the efficacy of inhalers yet cannot sustain their use due to financial constraints. Song et al. (2025) noted that rural Chinese residents fall significantly short of urban residents in terms of medical insurance reimbursement rates and coverage scope, with this disparity being particularly pronounced in the management of chronic diseases. On the other hand, the scarcity of inhalers in basic medical institutions further aggravates the predicament of "having the prescription but no medicine", making it difficult for patients to obtain the necessary treatment even if they are willing to pay (Ding et al. 2021; Yadav et al. 2020). Consequently, this study demonstrates that the dual constraints of limited inhaler device accessibility in primary medical institutions and inadequate medical insurance coverage trap patients in a "medication dilemma". The resulting "economic toxicity" not only includes the cost of inhalers themselves, but also encompasses "hidden costs" such as transportation and lost income, which forces patients to reduce their dosage, discontinue medication, or switch to cheaper but less effective, more accessible non-formal alternatives(Zafar et al., 2013). The WORLD BANK (2019) proposes that for economically disadvantaged areas, the government and healthcare security authorities may establish special subsidies to support basic healthcare institutions in medication procurement and increase medical insurance reimbursement rates, thereby reducing the financial burden on patients. In terms of resource allocation, prioritizing resources toward basic healthcare services can help alleviate the imbalance in medical resources caused by regional economic disparities. Research shows (Ding et al., 2021) that establishing performance mechanisms tied to service quality can stimulate the potential of grassroots medical staff in managing chronic disease, narrow the "knowledge-belief-behavior" gap, and enhance patients' trust in basic medical care. Furthermore, rural Chinese care personnel should strive to bridge clinical practice with policy advocacy, improve clinical nursing practices by enhancing the quality of clinical care, adhering to clinical guidelines, and focusing on patients' psychological and social needs, thereby promoting social health equity and improving the quality of life for rural Chinese COPD patients.

Conclusions

This study explored the inhaler use dilemma among COPD patients in rural China, based on the Social-Ecological Model, and identified five themes: individual, interpersonal, organizational, community, and policy levels. These need to be addressed through integrating multi-level nursing care for rural Chinese COPD patients. Our analysis revealed that patients’ education, family support, accessibility of primary care resources, and healthcare insurance policies at the local level were the most important factors needing to be addressed to improve the ability to use inhalers among Chinese COPD patients in rural areas. This study was limited to examining barriers to inhaler use specifically among patients with COPD in rural China. Therefore, generalizing the findings to other

rural areas should be done with caution. The viewpoints of medical personnel and family caregivers were not included in this investigation. In the future, it will be essential to confirm the actual effects of the multi-level intervention paths and expand the research design to incorporate multiple perspectives.

Relevance for Clinical Practice

The study findings suggest that multiple factors influence the use of inhalers among patients with COPD in rural China. Healthcare professionals can apply these research findings to clinical practice by conducting personalized health education tailored to rural life, activating the community support network, and conducting regular follow-up, assessing, and assisting patients with inhaler usage difficulties, thereby enhancing their motivation and ability. Additionally, in the face of the social health injustice endured by rural Chinese COPD patients, clinical healthcare staff should speak out actively and advocate for the optimization of grassroots resources and medical insurance policies, in order to alleviate the psychological and economic burdens of these patients and improve their quality of life.

Declarations

Data availability

The datasets generated and/or analysed during the current study are not publicly available due to the data are in Chinese but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and approved by The Affiliated Hospital of Southwest Medical University ethics committee(KY2025500). Written informed consent was obtained from each participant.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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Authors' contributions

YZ, LX: Study design, data collection and analysis, paper writing and revision; JC, BL, SZ, SL: Data analysis, paper review and revision; HH, JD: Research guidance, paper review, and funding support.

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