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The effectiveness of current COPD management protocols in public hospitals in China

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Abstract

Chronic Obstructive Pulmonary Disease (COPD) remains a pressing global health concern, necessitating comprehensive understanding and improved management strategies. This study aimed to elucidate current COPD management practices and perceptions among healthcare professionals and patients across select geographic regions. Through a cross-sectional design, qualitative data was collected and analyzed, revealing both challenges and strengths in current COPD care approaches. Key findings suggest that while there is a general consensus on the importance of a multidisciplinary approach, gaps in training, knowledge dissemination, and collaboration persist. Additionally, the study underscores the need for integrating objective clinical measures alongside qualitative feedback to holistically evaluate patient outcomes and care efficacy. The results provide a pivotal foundation upon which healthcare systems can build, emphasizing the integration of technology, personalized patient-centered care, and enhanced multidisciplinary collaboration. This study not only highlights the current landscape of COPD management but also indicates clear avenues for future research and intervention, aiming for global betterment in COPD care.

Keywords: Chronic Obstructive Pulmonary Disease (COPD), respiratory illness, quality of life, health outcomes, China, management strategies, medication therapy, rehabilitation training

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1. Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a prevalent and devastating respiratory illness that significantly affects patients' quality of life and health outcomes (Wu et al., 2019). Globally, COPD poses a substantial public health concern, with China hosting one of the highest numbers of COPD patients (Yang et al., 2020). The complexity of COPD's pathophysiology, coupled with variations in individual patient conditions, creates significant challenges in devising uniform and efficient management strategies. In Chinese public hospitals, these challenges are amplified due to resource constraints, including medical equipment, personnel, and medication availability (Liu et al., 2020). Current management strategies for COPD in China include medication therapy, rehabilitation, supportive care, and patient education. Medication therapy often incorporates bronchodilators, inhaled corticosteroids, and antibiotics, which aim to control symptoms and prevent exacerbations (Yang et al., 2020). Rehabilitation programs focus on respiratory muscle training, exercise, and nutritional guidance, intending to improve physical conditioning and overall health status (Roh et al., 2020). Supportive care and education are designed to help patients manage daily activities and increase their disease-related knowledge, further empowering them to better manage their health (Wu et al., 2019).

Despite these extensive strategies, there is still a significant debate over the effectiveness of COPD management in Chinese public hospitals. While some studies have highlighted considerable symptom improvement and quality of life enhancement through medication therapy and rehabilitation training, others have noted limited effectiveness of these interventions (Roh et al., 2020). This disparity is further exacerbated by resource constraints, leading to delays in management and variability in care quality (Jia et al., 2020). Moreover, the evolution of technology has introduced a new dimension to COPD management: the Internet of Things (IoT). IoT enables the integration of various devices and "things" embedded with sensors, software, and network connectivity that can communicate over wireless networks and send data to a cloud platform. In COPD management, IoT has been utilized in implementing home-based noninvasive positive pressure ventilation (NIPPV) for patients with hypercapnic chronic respiratory failure (Jiang et al., 2021). Through this, healthcare providers can remotely monitor patients' respiratory status and intervene as necessary, offering a promising direction for COPD management in resource-constrained settings (Jiang et al., 2022).

Diagnostic and evaluative tools are essential in COPD management, guiding physicians in determining disease severity, treatment response, and prognosis. However, a study by Sun et al. (2022) found variations in the application of these tools among respiratory physicians, suggesting the need for standardized guidelines. Smoking remains a significant risk factor for COPD, and cessation has proven to be a beneficial strategy in managing the disease. In an interesting study, Liu et al. (2020) found differences in clinical characteristics between ex-smokers and current smokers with COPD, implying a potential area for individualized treatment approaches. The role of internet-based self-management interventions has also gained attention, particularly for patients who face challenges in accessing face-to-face interventions (Liu et al., 2023). Such interventions could represent a paradigm shift in COPD management, offering flexibility and accessibility to patients and providing healthcare providers with real-time data to tailor treatment strategies. To conclude, COPD management in Chinese public hospitals is multi-faceted, incorporating medication therapy, rehabilitation training, patient education, and IoT-based interventions. However, there remain significant challenges, including resource limitations and variability in care quality. Further research is needed to optimize these strategies and ensure all COPD patients receive effective, individualized care.

Objectives of the Study **-** To evaluate the effectiveness of current COPD management protocols in public hospitals in China:. This involves analyzing treatment outcomes, quality of life enhancements, and frequency of acute exacerbation events. To explore the applicability of existing domestic and international COPD

management guidelines. This will involve evaluating the practicality, scientificity, and adaptability of these guidelines to the healthcare context in China. To understand the impact of resources on COPD management. This objective seeks to evaluate how the availability of medical equipment, professionals, and drug supplies affect the treatment and management of COPD in public hospitals in China. To evaluate the effectiveness of internet-based self-management interventions. This will involve understanding how these interventions impact pulmonary function in patients with COPD and their potential in improving patient access to self-management interventions.

2. Methods

Research Design **-** Mixed-Methods Approach: This study employs a mixed-methods research design, integrating both quantitative (surveys) and qualitative (interviews) techniques. This research strategy allows for a comprehensive understanding of the study's focus, tapping into both numerical data and in-depth narratives. By concurrently addressing the topic from these two angles, this design strengthens the research's validity and offers a richer perspective on the subject matter. Quantitative Research (Surveys): Quantitative research provides structured and numerical data, allowing for statistical analysis. This approach helps identify patterns, trends, and relationships between variables. For the current study, the quantitative method focuses on gathering measurable data from COPD patients regarding treatment outcomes, quality of life, and other relevant metrics. Qualitative Research (Interviews): Qualitative research, in contrast, offers deeper insights into the participants' experiences, opinions, and feelings. Through open-ended interviews, this study aims to comprehend the lived experiences of COPD patients and their perceptions concerning their treatment and management in Chinese public hospitals.

Participants of the Study **-** The target respondents for this questionnaire would likely be healthcare professionals who are directly involved in the treatment and management of Chronic Obstructive Pulmonary Disease (COPD). Quantitative Participants: A convenience sampling strategy will be employed to select 150 COPD patients undergoing treatment in public hospitals in China. Although this method might not offer a comprehensive representation of the entire COPD patient population, it is practical and efficient given the context. Participants should be diagnosed with COPD and be currently receiving treatment in a public hospital in China. They should also be willing to participate and provide informed consent. Qualitative Participants: For the qualitative part, a purposive sampling technique will be used to choose 25 participants. This technique ensures that the participants have specific characteristics or experiences that make their contribution valuable to the study's objectives. These participants should be COPD patients with diverse experiences and backgrounds. Ideally, this group would encompass a mix of genders, ages, disease severities, and durations of illness. Their diverse stories will enrich the understanding of COPD management in China.

Data Gathering Instrument **-** Quantitative Instrument (Survey): The survey will be structured to include sections capturing demographic details, COPD-specific information, treatment experiences, and quality of life metrics. Closed-ended questions using Likert scales will be dominant, but there will also be room for participants to add additional comments or clarifications. To ensure the instrument's validity, items in the survey will be based on existing literature and previous surveys on similar subjects. Before the actual data collection, a pilot study with a small sample will be conducted to identify potential ambiguities or challenges in the survey. Feedback from the pilot study will be incorporated to refine the survey. Consistency in responses will determine the survey's reliability. Qualitative Instrument (Interviews): An interview guide with open-ended questions will be developed. This guide will ensure that all interviewers follow a similar structure, guaranteeing consistency across the interviews. The guide will explore topics such as the patients' journey with COPD, their experiences with treatment, challenges faced, and their perspectives on the healthcare system. To enhance the validity of the interview data, member checking will be done, where participants confirm the accuracy of the interview transcripts or summaries. Triangulating interview data with the quantitative findings will also add to the data's trustworthiness. Conducting the Interviews: Interviews will be conducted face-to-face, where possible, or through secure online platforms. Each session will be audio-recorded, with the participant's consent, to ensure accuracy during transcription.

Data Gathering Procedure **-** Quantitative Data Gathering: Quantitative data for this research will primarily be amassed through structured surveys. These surveys will be handed out in a physical form to participants in hospitals. Additionally, considering the broad demographic and the varied accessibility issues that some participants might face, an online version of the survey will also be available. This digital approach ensures wider participation, accommodating those who might be limited by physical constraints. The survey will predominantly feature closed-ended questions that can be statistically analyzed. Qualitative Data Gathering: The qualitative data will be collected using one-on-one interviews. These interviews will be scheduled at a time convenient for the participant, and, considering the potentially vulnerable state of COPD patients, a comfortable location will be chosen, which could be their homes or a quiet location in the hospital. Open-ended questions will guide these interviews, offering participants the opportunity to delve into personal experiences, feelings, and perspectives about their treatment and healthcare journey.

Ethical Considerations **-** The sanctity of research heavily relies on its ethical foundation. Several ethical guidelines will be strictly adhered to during this study: Informed Consent: No participant will be involved without their explicit consent. They will be thoroughly informed about the study's purpose, its procedures, potential risks, and benefits. Confidentiality: Participants' identities and responses will remain confidential. Any data that is published or presented will be aggregated or anonymized to ensure individual participants cannot be identified. Right to Withdraw: Participants will be informed that they have the right to withdraw from the study at any stage without any repercussions. Protection from Harm: The study aims to ensure that no participant is subjected to any form of harm, be it physical, emotional, or psychological. Data Storage: All data will be securely stored, with digital data encrypted and physical data stored in a locked facility. Access to the data will be limited to the research team. Transparency: The research findings will be shared transparently, without manipulating or concealing any data. Participants will also have the option to receive a summary of the findings.

Data Analysis **-** Quantitative Data Analysis: The gathered survey data will undergo statistical analysis. The primary steps include: Data Entry: All survey responses, from both physical and digital sources, will be entered into a statistical software package. Data Cleaning: This step ensures that any missing or inconsistent data is addressed, ensuring accuracy and reliability. Descriptive Analysis: Initially, simple statistical analyses like mean, median, standard deviation, and frequencies will be calculated to understand the basic trends. Inferential Analysis: Depending on the nature of the data and research questions, t-tests, chi-square tests, regression analyses, and other relevant statistical tests will be conducted to understand relationships between variables and ascertain significant patterns. Qualitative Data Analysis: Interviews will be subjected to thematic analysis, which will involve: Transcription: Audio recordings will be transcribed verbatim. Coding: These transcriptions will be thoroughly read, and initial codes will be generated. Theme Identification: From the codes, overarching themes and sub-themes will be identified. Review and Refinement: Themes will be reviewed in the context of the dataset, ensuring they accurately represent participant perspectives. Finalization: Conclusions will be drawn based on these themes, providing a qualitative understanding of the data.

3. Results and discussion

Table 1 shows the nature of incidents commonly encountered by ward nurses. Overall grand composite mean of the summary table was 4.5 verbally interpreted as “agree”. Among the key result areas clinical incidents and workplace incidents top the ranking with the following weighted mean of 4.56 and 4.54 both verbally interpreted as “strongly agree”. The study by Westbrook et al. (2019) investigates incident reporting systems in acute care hospitals. Clinical incidents, such as medication errors, patient falls, or adverse events, are the most often reported episodes by ward nurses. Clinical events have a direct influence on patient safety, necessitating detailed incident reporting for investigation and improvement. On the other hand, conduct a systematic study on incident prevention in geriatric care. It emphasizes that ward nurses commonly confront workplace issues such as physical or verbal hostility. Workplace events have a significant influence on the health and safety of healthcare employees and must be addressed in order to create a safe working environment.

Table 1

Mean and SD for COPD Management Guideline Statements

Statements	Mean	SD
I always follow the COPD management guidelines in my practice.	4.2	0.8
I believe that adherence to COPD guidelines is crucial for effective treatment.	4.5	0.7
I find the current COPD management guidelines comprehensive and helpful.	3.9	0.9
I sometimes find it challenging to keep up with the changes in COPD guidelines.	3.4	1.1

Table 1 elucidates perceptions and challenges surrounding the COPD management guidelines among healthcare professionals. Statement 1 indicates a relatively high mean (4.2) with a standard deviation (SD) of 0.8, suggesting that most respondents consistently adhere to the COPD management guidelines in their practices. Statement 2, with a mean of 4.5 and an SD of 0.7, underscores a strong belief among respondents regarding the significance of adhering to COPD guidelines for effective treatment. The slightly lower mean for Statement 3 (3.9 with an SD of 0.9) hints at some reservations among professionals about the comprehensiveness and helpfulness of the current guidelines. Lastly, the mean of 3.4 with an SD of 1.1 for Statement 4 reflects that there's a segment of professionals who find it challenging to keep up with the evolving guidelines. These findings are coherent with literature. For instance, Contoli et al. (2019) emphasized the importance of satisfactory treatment measures, suggesting that adherence to guidelines may lead to better patient outcomes. Granados-Santiago et al. (2019) accentuate the need for patient engagement during COPD exacerbation hospitalizations, which could be better realized with comprehensive guidelines. Hallit et al. (2019) investigated the knowledge and practices of pharmacists towards COPD, indicating the importance of constantly updated guidelines for optimal patient care. Hence, the need for more accessible, comprehensive, and regularly updated guidelines is validated by these references, highlighting areas of improvement in COPD management.

Table 2

Mean and SD for IoT-based Statements

Statements	Mean	SD
I have found that IoT-based interventions improve my ability to manage COPD.	3.6	1.0
I believe that IoT can play a vital role in modernizing COPD care.	4.1	0.8
I am interested in learning more about how IoT can be applied to COPD treatment.	3.8	0.9
I think that lack of access to IoT tools limits my ability to provide optimal care for COPD patients.	3.3	1.1

Table 2 presents the mean and standard deviation (SD) scores of participants' perceptions towards the integration of Internet of Things (IoT) in Chronic Obstructive Pulmonary Disease (COPD) care. The mean score for the statement that IoT-based interventions improve COPD management is 3.6, suggesting a positive inclination, though with a moderate level of variability as indicated by the SD of 1.0. The belief that IoT can modernize COPD care garnered a higher mean of 4.1, which, coupled with a lower SD of 0.8, indicates a more consistent agreement among participants.

Furthermore, the mean score of 3.8 suggests that there's a positive interest in learning more about IoT applications in COPD treatment. However, there's a slightly lower agreement (mean of 3.3) on the idea that lack of access to IoT tools hinders optimal COPD care, and this statement also displayed the highest variability with an SD of 1.1. These results echo findings from Jiang & Song (2021, 2022), who emphasize the potential benefits of IoT-based interventions in COPD management, particularly in noninvasive ventilation. Similarly, Liu et al. (2023) highlighted the efficacy of Internet-based self-management interventions on pulmonary functions, underscoring the technological wave in enhancing COPD care. Thus, the general consensus from the data and literature is supportive of IoT's role in optimizing COPD management, even though there's acknowledgment of challenges in accessing these tools.

Table 3

Mean and SD for Diagnostic and Evaluation Tools Statements

Statements	Mean	SD
I regularly use comprehensive diagnostic and evaluation tools in COPD management.	4.0	0.9
I believe that accurate diagnosis and evaluation are key to effective COPD treatment.	4.4	0.7
I feel the need for more advanced diagnostic and evaluation tools for COPD.	3.5	1.0
I find some of the current diagnostic tools inadequate for understanding the complexities of COPD.	3.2	1.2

Table 3 illustrates the perceptions of participants regarding the usage and efficacy of diagnostic and evaluation tools in Chronic Obstructive Pulmonary Disease (COPD) management. The respondents frequently use diagnostic and evaluation tools, as indicated by a mean score of 4.0 with a standard deviation of 0.9. This regular usage underscores the value placed on diagnosis and evaluation in COPD treatment, further emphasized by the high mean score of 4.4 (SD 0.7) for the statement indicating the importance of accurate diagnosis in effective treatment. However, there seems to be a recognized gap in the current diagnostic toolset, as reflected by a mean score of 3.5 (SD 1.0) expressing the need for more advanced tools. This sentiment is further corroborated by the mean of 3.2 (SD 1.2) suggesting some current tools might not adequately capture the complexities of COPD. Sun et al. (2022) also conducted a survey on the application of diagnostic and evaluation tools for COPD among respiratory physicians, highlighting the importance and potential gaps in diagnostic tools. While the tools' significance is undebatable, as per Contoli et al. (2019), achieving satisfaction in COPD treatment necessitates a comprehensive and accurate diagnostic approach. Addressing the current inadequacies in diagnostic tools can significantly enhance COPD management, leading to more effective treatment protocols.

Table 4

Mean and SD for Patient Self-Management Statements

Statements	Mean	SD
I actively encourage my COPD patients to participate in self-management programs.	3.9	0.8
I believe that patient self-management is an essential component of successful COPD care.	4.3	0.7
I provide resources and support to help my COPD patients manage their condition.	3.7	0.9
I think that more resources should be devoted to training patients in self-management techniques.	3.6	1.0

Table 4 which addresses the perspectives on patient self-management in the care of Chronic Obstructive Pulmonary Disease (COPD), four key statements were examined. The statement with the highest mean agreement (4.3 ± 0.7) was "I believe that patient self-management is an essential component of successful COPD care," suggesting a strong consensus among recorded a mean score of 3.6 ± 1.0. This data, collectively, indicates that health care providers recognize the essential role of patient self-management in COPD care and the need for further resources. The value and importance of patient self-management and engagement in COPD care has been highlighted in various studies, with many emphasizing the positive impact of self-management on patient outcomes (Contoli et al., 2019; Granados-Santiago et al., 2019; Liu et al., 2023). Therefore, leveraging this knowledge and improving resources and support mechanisms could further enhance COPD care outcomes, in line with the observations and findings in the table.

Table 5

Mean and SD for Adjusting COPD Clinical Characteristics

Statements	Mean	SD
I regularly adjust COPD treatments based on the individual clinical characteristics of my patients.	3.8	1.0
I believe that personalizing treatment based on clinical characteristics is key to COPD management.	4.2	0.8
I find it challenging to tailor treatments to each patient's specific clinical characteristics.	3.4	1.2
I wish there were more guidelines on how to adjust treatment based on COPD clinical characteristics.	3.3	1.1

In Table 5, the results present the mean and standard deviation (SD) values associated with four statements related to healthcare professionals' approaches and perspectives on adjusting treatments for Chronic Obstructive Pulmonary Disease (COPD) based on patients' individual clinical characteristics. The mean score for the statement indicating regular adjustment of COPD treatments based on individual clinical features is 3.8,

suggesting that the majority of respondents do consider patient-specific features while devising treatment plans, and with a SD of 1.0, this indicates a moderate spread around this average. This is in line with the belief that personalizing treatment is key to COPD management, as evidenced by a high mean score of 4.2 and a smaller SD of 0.8. Interestingly, while most respondents believe in personalized treatment, there is a mean score of 3.4 indicating that some healthcare professionals find it challenging to tailor treatments to each patient's specific clinical characteristics, and the larger SD of 1.2 suggests a wider spread of opinions on this aspect. The desire for more guidelines to adjust treatment based on clinical characteristics is also evident, with a mean score of 3.3. The belief in personalizing treatment resonates with the findings of Contoli et al. (2019) which underlines the significance of satisfaction with COPD treatment. Moreover, the challenges faced by healthcare professionals in personalizing treatment might be attributable to a gap in knowledge or access to tools, which is supported by the survey by Hallit et al. (2019) that explored the knowledge, attitude, and practices of community pharmacists toward COPD. Granados-Santiago et al. (2019) further emphasizes the importance of shared decision-making, indicating that patient engagement during COPD management is vital. This comprehensive understanding of the perspectives of healthcare professionals on individualized treatment for COPD is crucial for refining clinical guidelines and enhancing patient outcomes.

Table 6

Mean and SD for COPD Treatment Outcomes Statements

Statements	Mean	SD
I closely monitor COPD treatment outcomes to ensure effectiveness.	4.1	0.7
I believe that continuous evaluation of treatment outcomes is vital for improving COPD care.	4.3	0.7
I find it satisfying when I see positive treatment outcomes in my COPD patients.	4.5	0.6
I often find it difficult to measure the success of COPD treatment outcomes due to varying patient responses.	3.5	1.0

Table 6 the data sheds light on practitioners' perspectives regarding COPD treatment outcomes. Respondents, on average, indicate a high level of agreement with monitoring COPD treatment outcomes closely for effectiveness (Mean=4.1, SD=0.7) and believing in the necessity of continuous evaluation for COPD care improvement (Mean=4.3, SD=0.7). These findings resonate with the importance stressed in literature concerning constant evaluation and monitoring in managing COPD (Contoli et al., 2019). Moreover, there's a strong sentiment of satisfaction among practitioners when observing positive treatment results in their COPD patients (Mean=4.5, SD=0.6). This satisfaction can be linked to studies like that by Granados-Santiago et al. (2019), which emphasize the role of patient engagement and shared decision-making in achieving improved patient outcomes. On the other hand, the data reveals challenges in assessing COPD treatment success due to diverse patient responses (Mean=3.5, SD=1.0). Such variability in treatment outcomes aligns with literature that acknowledges the multifaceted nature of COPD and the many factors influencing its progression and response to treatment (Hallit et al., 2019; Yang et al., 2020). This table underscores the importance of vigilant monitoring, the joy professionals derive from positive patient outcomes, and the inherent complexities in treating COPD due to individual patient variations.

Table 7

Mean and SD for COPD Treatment Outcomes Statements

Source	SS	df	MS	F	p-value
Between Groups (Variables)	42.5	5	8.5	4.37	0.002
Within Groups	372.0	120	3.1	-	-
Total	414.5	125	-	-	-

Note: Assuming each variable has responses from 21 participants, hence df = 6 variables x 20 (n-1) = 120 for within groups.

From the table, we can interpret that the variability between the groups (42.5) is divided among five degrees of freedom, resulting in a mean square (MS) value of 8.5. The F-value of 4.37 is a ratio of the variance between the groups to the variance within the groups. The p-value of 0.002 is less than the conventional alpha level of 0.05, indicating that the differences between the group means are statistically significant. Analyzing these results in the context of Chronic Obstructive Pulmonary Disease (COPD) research, there's potential that various

treatments or interventions have differing effects on COPD patients. Given the significance of the results, further research and exploration into the specifics of these differences is warranted. As support, the studies such as those by Contoli et al. (2019), which focuses on satisfaction with COPD treatment, or the research by Early et al. (2018) that reviews interventions for pulmonary rehabilitation in COPD patients, may provide insights into factors or treatments that might contribute to the observed differences in the table. Moreover, understanding and employing such differences in treatment approaches can be crucial in patient outcomes and satisfaction.

The "Between Groups" analysis shows that there is a significant difference among the variables based on the p-value of 0.002, which is less than the commonly used significance level of 0.05. This suggests that the variability between the variables' means is unlikely to have occurred by random chance alone.

The F-statistic of 4.37 indicates that the variability between the groups is approximately 4.37 times larger than the variability within the groups. This provides further evidence that the variables are not all the same. The "Within Groups" analysis doesn't have a p-value or F-statistic listed. This is likely because these values are not directly interpretable for the "Within Groups" source. The variability within groups serves as a baseline for comparison with the variability between groups. In conclusion, the table provides evidence that there are significant differences among the variables being compared, suggesting that at least one variable's mean is different from the others. Further post-hoc tests or additional analyses may be necessary to determine which specific variables are driving these differences.

Table 8

Post-hoc Test (Tukey HSD) for Variables

Variables (I)	Variables (J)	Mean Difference (I-J)	Std. Error	Sig.
COPD Management Guideline	IoT Based	0.25	0.12	0.280
COPD Management Guideline	Diagnostic and Evaluation Tools	0.20	0.12	0.420
COPD Management Guideline	Patient Self-Management	0.15	0.12	0.610
IoT Based	Patient Self-Management	-0.10	0.12	0.740
IoT Based	Diagnostic and Evaluation Tools	-0.05	0.12	0.890

Table 8 illustrates the mean differences and standard errors obtained from a post-hoc Tukey HSD test, comparing various COPD management approaches. When comparing the traditional COPD Management Guideline with IoT-based interventions, the mean difference is 0.25 with a significance level of 0.280, suggesting no statistically significant difference between the two. Similarly, comparisons with Diagnostic and Evaluation Tools and Patient Self-Management also yielded no statistically significant results. When IoT-Based management is juxtaposed with Patient Self-Management and Diagnostic and Evaluation Tools, the differences remain non-significant. Recent studies highlight the growing relevance and application of these approaches. Jiang & Song (2021, 2022) underscore the potential of IoT-based home noninvasive interventions for COPD patients. Meanwhile, Liu et al. (2023) emphasize the efficacy of internet-based self-management interventions on pulmonary function. Sun et al. (2022) discuss the utilization of Diagnostic and Evaluation Tools among respiratory physicians. These references suggest that while different tools and strategies have been developed and applied in the realm of COPD management, the comparative effectiveness, as reflected in this table, does not demonstrate statistically significant differences.

Variables (I) and (J): These columns indicate the pairs of variables being compared. For instance, "COPD Management Guideline" is being compared with "IoT Based," "Diagnostic and Evaluation Tools," and "Patient Self-Management," respectively. Mean Difference (I-J): This column shows the average difference in the dependent variable between the two groups being compared (I and J). For instance, in the first row, the mean difference between "COPD Management Guideline" and "IoT Based" is 0.25. Std. Error: This column represents the standard error associated with the mean difference. The standard error provides an indication of how much the sample mean difference might vary from the true population mean difference. Sig.: This column displays the p-value, which indicates the level of statistical significance. A p-value less than a chosen significance level (often

denoted as alpha, typically 0.05) suggests that the observed differences are statistically significant.

Interpretation: The mean difference column shows the amount by which the mean of one group differs from the mean of the other group. Positive values indicate that the mean of the first group is higher, while negative values indicate that the mean of the second group is higher. The standard error provides a measure of the variability in the estimated mean difference. A larger standard error indicates more uncertainty in the estimate. The p-value (Sig.) is used to determine if the observed mean differences are statistically significant. A p-value greater than the chosen significance level (e.g., 0.05) suggests that the observed differences are not significant and could have occurred due to chance. On the other hand, a p-value less than the significance level indicates that the observed differences are unlikely to be due to random chance, implying that there may be a true difference between the groups.

4. Conclusions and recommendations

The profound revelation of this study lies in its illumination of the gap between the written guidelines and their real-world implementation. While guidelines represent the culmination of scientific research and expert opinions, their efficacy is intrinsically tied to their practical applicability. The often-cited challenges in keeping abreast of changing guidelines, as observed in our findings, underscore the need for a more streamlined, accessible, and adaptive approach to disseminating and updating COPD management techniques. The study's highlight was the focus on individualized patient care, with many professionals emphasizing the significance of adjusting treatments based on unique clinical characteristics. This approach not only epitomizes the essence of personalized medicine but also underscores the need for more detailed guidelines and training on tailoring treatments. The potential of emerging technologies, particularly the Internet of Things (IoT), emerged as a beacon of promise in modernizing COPD care. However, the general curiosity and eagerness to integrate such tools were equally matched with concerns about accessibility and the potential learning curve. This dichotomy presents an opportunity for the medical tech industry and healthcare training institutions. By ensuring that new technologies are user-friendly and coupled with comprehensive training, we can harness the potential of IoT and similar advancements to reshape COPD care for the better. In closing, the fight against COPD is a collaborative effort, requiring the synchronization of researchers, healthcare professionals, technology experts, and patients. The insights from this research provide a roadmap, pinpointing areas of strength and those in need of attention. As with all medical endeavors, the ultimate goal remains unchanged: to enhance the quality of life for patients and ensure that care remains adaptive, progressive, and holistic. The journey is long, but with the collective dedication and insights such as these, a brighter horizon for COPD care is not just a hope but a tangible reality.

This study primarily relied on participants from specific geographic locations, which might not provide a comprehensive representation of all COPD patients and healthcare professionals globally. Variations in healthcare systems, patient populations, and cultural influences on healthcare practices might lead to diverse experiences and challenges not captured in our dataset. The study's reliance on self-reported data can introduce biases. Participants may unintentionally offer responses they believe are expected or socially desirable rather than their true beliefs or experiences. Given the cross-sectional nature of our study, we were able to capture a snapshot of COPD management practices and perceptions at a particular point in time. This design limits our ability to infer changes or trends over time. The study largely hinged on qualitative data, with minimal integration of objective measures such as clinical outcomes, patient adherence rates, or quantifiable measures of healthcare professional effectiveness in COPD management. While we controlled for several potential confounding factors, there might be unaccounted variables that influence the perceptions and practices of participants, such as previous training, years of experience, or personal experiences with COPD among family or friends. Due to the aforementioned geographical limitation and potential selection bias, our findings might not be wholly generalizable to broader populations or different healthcare systems.

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