



Analysis of the Accuracy of Inhaler use Technique in Patients with Chronic Respiratory Disease : A Case Study

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Article Info	Abstract
Manuscript Received: 01 May, 2026 Revised: 01 Jul, 2026 Accepted: 01 Aug, 2026 Date of Publication: 09 Aug, 2026 Volume: 2 Issue: 1	Introduction: Correct inhaler technique is critical for achieving optimal therapeutic outcomes in individuals with chronic respiratory diseases, including asthma and Chronic Obstructive Pulmonary Disease (COPD). Although Metered-Dose Inhalers (MDIs) are widely used, incorrect technique persists and leads to suboptimal pulmonary drug deposition, ongoing symptoms, frequent exacerbations, and increased healthcare utilization. Methods: Descriptive interventional case study included five adult outpatients (aged 18–60 years) diagnosed with asthma or COPD in July 2026. We evaluated inhaler technique using a standardized nine-step observation checklist derived from the Global Initiative for Asthma (GINA) and Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines. Participants received individualized education comprising verbal review, visual demonstration, supervised return demonstration, and immediate corrective feedback. We reassessed inhaler technique after the intervention. Result: Before the intervention, all participants showed moderate inhaler technique, with a mean score of 6 out of 9 (66.7%). The most frequent critical errors were observed in the final exhalation step (0% accuracy), shaking the inhaler for medication homogenization (20%), and synchronizing inhalation with canister actuation (20%). After the educational intervention, the mean score increased to 8.8 out of 9, reflecting a 29.3% improvement. Four participants (80%) achieved perfect performance (9 out of 9), and one participant (20%) demonstrated good performance (8 out of 9). Accuracy in medication homogenization and final exhalation improved to 100% following training. Conclusion: Focused education utilizing the teach-back method effectively improved inhaler technique and corrected critical psychomotor errors within a short timeframe. Routine assessment and reinforcement of inhaler technique should be integrated into respiratory nursing practice to optimize treatment outcomes and support long-term disease management.
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INTRODUCTION

Inhaler therapy is a cornerstone of managing chronic respiratory diseases, particularly Chronic Obstructive Pulmonary Disease (COPD) and asthma, because it delivers medication directly to the respiratory tract with minimal systemic side effects (1). The clinical effectiveness of this therapy depends heavily on patients' correct inhaler technique (2). However, incorrect inhaler use remains a significant challenge in clinical practice. Several studies indicate that only 4 out of 92 patients (4.3%) used their inhalers correctly (3). Such errors can significantly reduce drug deposition in the lungs and compromise treatment outcomes (4). Therapy failure not only worsens clinical symptoms but also increases the risk of acute exacerbations, hospital admissions, and overall healthcare costs (5).

Therefore, inhaler effectiveness is closely linked to proper usage technique, making correct inhaler use a critical clinical and practical issue, not merely a technical one.

Many patients struggle to use inhalers correctly for several reasons. Scientific evidence shows that the high prevalence of errors stems from the complexity of *inhaler devices and a lack of ongoing patient education* (6). *Different devices, such as Metered-Dose Inhalers (MDIs) and Dry Powder Inhalers (DPIs), require varying techniques, including coordination, speed, and depth of inhalation, which can be confusing for users* (7). *Additionally, limited time for healthcare providers to demonstrate, review, and evaluate inhaler technique during outpatient visits contributes to poor retention and improper use among patients* (8). *As a result, critical errors occur, such as failing to exhale fully before inhaling medication, incorrect timing of canister actuation, and insufficient inhalation strength, which are frequently observed in daily clinical practice* (3). These issues indicate that inhalation therapy failure is not solely due to patient negligence but also results from complex instructions and inadequate clinical education.

From a broader perspective, the consequences of patients' inability to achieve proper inhalation technique should not be underestimated. Ineffective inhaler use directly contributes to persistent clinical symptoms, which significantly reduce patients' quality of life and limit their daily physical activities (9).

Furthermore, suboptimal drug deposition increases the burden on national healthcare services, as evidenced by rising emergency room visits and hospital readmissions, which could be prevented (10). Without proper technique, inhaler use loses its therapeutic value and wastes healthcare resources. Therefore, inhaler therapy requires strict supervision to ensure patients have the necessary technical skills.

Given the urgent need to address therapy failures, a comprehensive study is required to map this issue holistically. By integrating current literature and recent research, this article aims to provide significant practical contributions, particularly for nurses in designing more effective, measurable, and sustainable educational programs (11). Ultimately, implementing targeted intervention strategies is expected to bridge gaps in current therapy, reduce acute exacerbations, and improve the quality of life for patients with chronic respiratory disorders in Indonesia.

METHOD

This study used a descriptive case study design to directly evaluate inhaler technique through observation, focusing on the prevalence and patterns of errors, specific tool use, and the impact of repeated training on patient outcomes. The research was conducted in July 2026 at a hospital and involved adult patients aged 18–60 years who had been diagnosed with chronic obstructive pulmonary disease (COPD) or asthma and were receiving inhaler therapy. Inclusion criteria were: (1) use of a *Metered Dose Inhaler (MDI)*, (2) ability to communicate effectively, and (3) willingness to sign informed consent. We excluded patients with severe exacerbations that precluded observation of inhaler technique. At baseline, patients demonstrated their usual inhaler technique without additional instruction. The intervention consisted of an independent 15–20-minute session. Following the intervention, nurses recorded each step using an observation checklist based on the Global Initiative for Asthma (GINA) or Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines to identify critical errors. We determined patient accuracy by comparing performance with the Standard Operating Procedures (SOP) for MDI use. Accuracy was categorized as follows: correct (total score 8–9), adequate (score 5–7), and incorrect (score <5 or failure at critical steps such as maximum expiration, inhalation and activation, or breath retention). Accuracy was measured using a standardized final score to determine patient capability. The student provided direct educational intervention using a repeated demonstration (teach-back) method. The effectiveness of the technique was evaluated post-intervention to assess psychomotor retention. The case study stages included initial assessment, planning, implementation of inhalation technique education, and evaluation. Data collection involved direct evaluation using a checklist based on GINA and GOLD standards. The entire study adhered to ethical principles in health research, including obtaining informed consent and maintaining patient anonymity.

RESULTS

Assessment

An initial assessment was conducted with five patients diagnosed with asthma who use a Metered-Dose Inhaler (MDI) as their primary therapy. Technique accuracy was evaluated through direct observation using a standardized checklist based on the international GINA guidelines, which include nine critical steps.

Based on the observations, all patients (100%) demonstrated an 'adequate' level of ability, with scores ranging from 5 to 7 out of 9. None of the patients performed all steps perfectly (9 out of 9). Table 1 presents the detailed distribution of abilities and technical errors for each patient.

Table 1. Distribution of Patient MDI Technical Skills at Initial Assessment

Procedure steps MDI	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Amount Yes (%)	Issue Status
Preparation	Yes	Yes	Yes	Yes	Yes	5(100%)	Independent
Homogenization	Yes	No	No	No	No	1(20)	Critical
Expiration maximum	No	Yes	Yes	No	Yes	3(60%)	Troubled
Position	Yes	Yes	Yes	Yes	Yes	5(100%)	Independent
Inhalation and Activation	Yes	No	No	No	No	1(20)	Critical
Breath Retention	Yes	Yes	Yes	Yes	Yes	5(100%)	Independent
Final Expiration	No	No	No	No	No	0(0%)	Total Error
Interval (If dose >1)	Yes	Yes	Yes	Yes	Yes	5(100%)	Independent
Hygiene	Yes	Yes	Yes	Yes	Yes	5(100%)	Independent
SCORE	7/9 Enough	6/9 Enough	6/9 Enough	5/9 Enough	6/9 Enough	Average 6/9	Category: Enough

Planning

The planning process followed the issues identified in the study. The initial design used a clinical education method focused on metered-dose inhaler (MDI) use to address critical points in patient care. Three primary problems contributed to total error status and critical value: the end-expiration step (0%), homogenization or shaking of the device (20%), and inhalation with activation (20%). The most problematic step was maximum expiration (60%). Consistently maintained steps included preparation, positioning, breath retention, dose interval, and hygiene (100%).

The implementation plan targeted total *error status* and critical value by employing a three-stage educational approach: review, demonstration, and self-testing. Each patient received individualized instruction lasting 15-20 minutes.

Implementation

After evaluating patients' inhaler use, researchers gave each patient an observation sheet and explained which steps they performed incorrectly or missed. They clarified the difference between technical errors, such as shaking the inhaler or synchronizing breathing, and persistent clinical symptoms. Patients reported they had never

received detailed education from healthcare staff before and believed that simply spraying the medication into the mouth would automatically deliver it to the lungs. After the researchers' explanation, patients were cooperative and enthusiastic about improving their technique to reduce frequent relapses of shortness of breath.

In the second stage, the nurse provided a visual demonstration using a dummy inhaler, followed by a clear explanation of the clinical reasons behind each step.

The procedure emphasized three critical steps. The nurse demonstrated the homogenization technique by showing how to hold and shake the inhaler up and down 4–5 times to ensure proper mixing of the drug and propellant. Patients carefully observed each movement, particularly the synchronization of slow inhalation with canister activation. Their responses were monitored, and they provided verbal confirmation. Some patients spontaneously attempted to mimic the hand movements and breathing patterns, indicating cognitive adaptation to the new psychomotor information.

In the third stage, patients practiced all nine steps of MDI use from start to finish using demonstration tools. Researchers provided immediate feedback whenever errors occurred, guiding patients until they performed the procedure correctly. Patients then repeated the technique independently, with the nurse offering instant corrections as needed until each patient achieved 100% accuracy by the end of the session. Patients 2, 3, and 4 initially pressed the canister before inhaling, but after the nurse corrected them, they acknowledged the mistake and repeated the step more carefully. Patient 4 initially struggled to coordinate maximum exhalation before inhaling the medication due to a sensation of chest emptiness, but succeeded after the nurse provided counting guidance. Although some patients still felt uncertain, by the end of the session, after correctly completing nearly all steps (scoring 8/9 or 9/9), they expressed relief and increased confidence, noting that the new breathing method made their chests feel more comfortable than before.

Evaluation

The final evaluation of outcomes in five patients demonstrates clinically significant improvements in skills following focused educational interventions. Table 2 presents the distribution of change scores and the categories for each subject.

Table 2. Results of Achievement Evaluation Individual After Done Intervention

Subject Study	Initial assessment score	Initial category	Final evaluation score	Final category	Score improvement
Patient 1	7/9	Enough	9/9	Good (Perfect)	+2
Patient 2	6/9	Enough	9/9	Good (Perfect)	+3
Patient 3	6/9	Enough	9/9	Good (Perfect)	+3
Patient 4	5/9	Enough	8/9	Good	+2
Patient 5	6/9	Enough	9/9	Good (Perfect)	+3
Average score	6/9	Enough	8.8/9	Good	+2

Evaluating the effectiveness of educational interventions using repeated demonstration methods showed a significant increase in the group's average score from 6 out of 9 (categorized as Sufficient) to 8.8 out of 9 (categorized as Good). This improvement indicates a 29.3% enhancement in technical competence compared to the pre-education condition. The mean improvement score among patients was +2.8, suggesting that individually delivered interventions were highly effective in rapidly changing patients' psychomotor behaviors. Additionally, the expiration step, which initially had a Total Error status (0% success), was completely resolved, achieving 100% success after all patients were guided to exhale slowly following breath retention. Similarly, the Homogenization and Inhalation/Activation steps, which began in *Critical* status (only 20% success), improved to 100% for homogenization and 80% for inhalation-activation synchronization.

DISCUSSION

Assesment

Patient 1 showed the highest competence among all participants in this study, successfully completing 7 of 9 required steps. This patient was independent and followed instructions well, especially in homogenizing the medication and coordinating inhalation with activation. However, patient 1 did not fully comply with the breathing mechanics, specifically during maximum and end expiration. The patient placed the *mouthpiece in their* mouth without first emptying the residual air from their lungs, and then resumed normal breathing immediately after holding their breath. This incorrect breathing pattern reduced the available tidal volume for drawing in aerosols, so the medication did not deposit optimally in the alveoli (12).

Patients 2, 3, and 5 showed a fully psychomotor error pattern. Patients 2, 3, and 5 showed the same psychomotor error pattern. These patients completed the basic procedural steps, including performing maximum expiration before inhaling the medication. However, they all failed at several critical points: homogenization, inhalation and activation, and end expiration. They did not shake the inhaler properly, and poor coordination between pressing the canister and inhaling led to uneven medication delivery. As a result, larger aerosol particles remained in the oropharynx instead of reaching the lungs. This explains why their therapy was not effective in controlling clinical symptoms of exacerbation (13).

Patient 4 demonstrated the lowest psychomotor performance in the initial assessment, accumulating four errors across nine procedures. This patient experienced complications resulting from a combination of pharmaceutical errors, poor timing coordination, and improper breathing mechanics. The steps involving homogenization, maximal expiration, inhalation and activation, and end expiration were all marked as “No.” The subject's metered-dose inhaler (MDI) usage pattern resembled that of a standard spray bottle: the device was not shaken, the lungs were not emptied, and the canister was pressed without synchronizing with a slow, deep inhalation. Clinically, this poor technique prevented effective drug delivery to the lower respiratory tract, so the patient's regular inhaler use provided only psychological reassurance without producing real bronchodilation effects (14).

In this study, inhalation errors among patients exhibited distinct patterns. Patient 1 experienced difficulty with breathing patterns, whereas patients 2 and 3 had problems with fine-motor coordination, device preparation, and synchronization. These challenges arise because, from a psychomotor perspective, MDI devices require complex multidimensional coordination between breathing mechanics and device activation. Each individual possesses different adaptive capacities and habits in interpreting clinical instructions (14).

Planning

The study results indicate a significant psychomotor deficit among patients in correctly using Metered-Dose Inhalers (MDIs). The most critical errors occurred during exhalation, with a 0% success rate, followed by low accuracy in device shaking (20%) and coordinating inhalation with device activation (20%). These findings align with global literature, which reports that technical errors in MDI use are common in clinical practice. It is estimated that more than 70–80% of patients do not use their inhalers correctly without structured education (2) .

Implementation

During the initial implementation phase, study findings indicate that most patients made fundamental errors in metered-dose inhaler (MDI) use. Many patients believed that simply spraying the medication into the oral cavity would automatically deposit the drug into the lower respiratory tract. This misconception stemmed primarily from a lack of comprehensive education from healthcare providers during previous treatments. These results align with previous research (7), which found that educational interventions can improve patients' inhalation skills regardless of the device used. Additionally, (15) reported that the average technical proficiency in inhaler use increased significantly from 25% before intervention to 62% after educational sessions for asthma treatment. Similarly, both the initial and post-intervention mean scores for inhaler technique demonstrated statistically significant improvements following the intervention (11).

The observation sheet process begins by explaining the link between technique errors, such as inadequate medication homogenization, and persistent clinical symptoms. When patients can link incorrect technique to recurring symptoms, such as frequent relapses of shortness of breath, their confidence in using the correct technique improves. This also improves their subjective assessment of the benefits of proper inhaler use. This positive psychological response is reflected in increased cooperation and enthusiasm among patients to improve their technique, ultimately leading to better symptom control (16). Implementation second based on guide *Global Initiative for Asthma* (2) that adequate homogenization is crucial to ensure inhaled drug dose is stable and precise. This phase emphasizes demonstration using a dummy inhaler, accompanied by detailed explanations.

The clinical rationale behind each procedural step is explained, with particular focus on three critical steps: homogenizing the drug by shaking the inhaler 4–5 times, pressing the *canister*, and synchronizing with slow inhalation. Explaining the clinical reasons, such as the importance of shaking the inhaler to ensure a homogeneous mixture of the drug suspension and propellants, provides logical justification that reinforces patients' cognitive understanding.

During the observation process, patients spontaneously mimicked hand movements and adopted slow breathing patterns, indicating ongoing cognitive adaptation within the motor learning process. According to *Social Learning Theory*, visual modeling followed by active engagement accelerates motor memory formation (17). Providing instructions in simple, stepwise formats has proven effective in minimizing cognitive load, thereby facilitating patients' understanding and coordination of hand movements with breathing.

The third phase highlights the importance of evaluating independent patient actions through repeated demonstrations and immediate feedback. At this stage, patients 2, 3, and 4 continued to exhibit automatic responses, such as pressing the canister before initiating inhalation. However, direct nurse correction enabled these patients to perform the correct technique. Research (18) demonstrates that interventions involving repetitive physical exercises yield comparable improvements in both physical (46%) and motor (45%) skills, with the greatest success observed in these patients. Additionally, direct correction effectively addressed subjective physical barriers, as seen in patient 4, who initially struggled to inhale after maximal expiration due to chest tightness. Using a nurse-guided counting technique, the patient regulated breathing rhythm and overcame the identified psychophysiological barrier. Gradual mentoring facilitated procedural accuracy, with patients achieving scores of 8/9 and 9/9 on the observation sheet. In routine asthma and COPD care, treatment initiation can be influenced by various psychological and practical barriers, including denial of diagnosis, disease awareness, lack of trust in healthcare providers, fear of medication, cognitive ability, affordability, and access to therapy (19). Direct correction proved effective in maintaining inhaler technique skills in this study.

Evaluation

Evaluation results show a meaningful improvement in individual scores and knowledge or skills after the intervention. Before the intervention, all patients were in the "Sufficient" category, with an average initial score of 6 out of 9 (range 5–7). After the intervention, the average final score rose to 8.8 out of 9, an improvement of 2.8 points. Patients 1, 2, 3, and 5 achieved a "Good (Perfect)" rating with a final score of 9 out of 9, while patient 4 reached the "Good" category with a score of 8 out of 9.

In addition, all patients showed improved experience scores after the intervention, with improvement levels varying by individual. Patients 2, 3, 4, and 5 each improved by 3 points, while patient 1 improved by 2 points. Patient 1 started with a higher initial score (7 out of 9) compared to the others (5–6 out of 9), so a 2-point increase brought this patient to the maximum score of 9. Patient 4 improved from 5 to 8 out of 9 (+3 points), reaching the "Good" category. Cognitive learning effectively improves understanding and supports recovery and achievement in healthy patients. Cognitive learning through knowledge can be improved through the process of receiving information, repeated understanding, and strengthening material in a structured way (20). Education delivered systematically and repeatedly, using simple media, will effectively increase understanding and meet evaluation criteria for patient satisfaction (21). Overall, this study found that patients in the "sufficient" category improved after education, showing

that chronic disease management requires regular integration into health services to support patient independence and long-term therapy success.

CONCLUSIONS

In summary, this study demonstrates that individualized clinical education using the teach-back method is highly effective in rapidly correcting critical psychomotor errors associated with metered-dose inhaler use in patients with airway disease; structured demonstrations and immediate feedback significantly improved patient technique, shifting performance from 'Fair' to 'Good/Perfect'.

Although the sample size was limited, as is common in case studies, the findings highlight the essential need to incorporate standardized inhaler technique assessments into routine outpatient nursing workflows. Future practice should emphasize ongoing, structured patient education to improve treatment adherence, reduce acute exacerbations, and enhance overall health outcomes in respiratory nursing care.

AUTHOR'S CONTRIBUTION STATEMENT

Conceptualization: I; Methodology: SY, I; Data Collection: I, SY; Formal Analysis: I, SY; Writing Original Draft: I; Writing Review & Editing: I, SY, I. All authors have read and approved the final manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest related to this study.

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