

The role of Community Pharmacists in the Improvement of Inhaler Technique in people with Asthma

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Abstract:

Improper technique of inhaler is a significant barrier towards managing asthma around the world. This was a pilot study conducted to assess the effectiveness of pharmacist provided inhaler technique training in Qatar and Kenya at the pharmacies community level. 120 adult asthma patients who employ the use of the metered dose inhalers (MDIs) were enrolled. Baseline measurements showed that, only 28.3 percent of patients showed that they had the right method of using the inhaler. After a 1-to-1 inhaler technique, training with pharmacist and 4-week follow-up, the results significantly increased to 82.5% ($p < 0.001$). Moreover, the intervention caused the subjects to increase their asthma control test (ACT) scores and decrease their utilisation of short-acting 2 agonist, which is an indicator of improved asthma control. These results indicate that community pharmacists can have an important role in filling the inhaler technique education gaps and, as a result, positive outcomes in asthma management. It may be concluded that the study implies that pharmacists have a big role to play in asthma management and enhance patient outcomes.

Keywords: Inhaler technique, asthma, pharmacist-led education, community pharmacy, metered-dose inhaler, asthma control.

1. Introduction

1.1 Global Challenge of Asthma burden

Asthma is one of the common chronic respiratory illnesses, and it has affected millions of people in all parts of the world, with the number of people in the world living with asthma estimated at 300 million. The disease is described by the fact that it is a chronic inflammation of the airways, so this results in intermittent bouts of wheezing, shortness of breath, chest tightness, and cough. The quality of life is greatly affected by asthma and it is linked with a high hospitalization rate, emergency department visits and morbidity. Asthma is poorly controlled in most of the countries particularly those located in areas of poor healthcare provision, with the resultant effect of wastage of healthcare facilities and loss of productivity. An increase in the burden of asthma is contributed by the asthma exacerbations mostly caused by environmental factors including allergens or air pollution. Since it is quite common and chronic, asthma is one of the most serious public health issues in the world, and the effective methods and approaches to managing and preventing it are to be found.(1)

1.2 Importance of inhaler method in term of control of asthma.

Correct use of inhalation devices is one of the most important aspects of proper asthma management due to the fact that daily use of inhalers is the most popular means of delivering drugs in cases of asthma treatment. The transport of bronchodilators or corticosteroids directly to the lungs due to metered-dose inhaler (MDIs), jointly with spacers or nebulizers, offers the patient an immediate effect and maintenance of symptoms over time. Nevertheless, improper use of inhaler constitutes one of the greatest impediments of good asthma management. Inhaler misuse in asthma patients has been a concern in many studies because a considerable percentage of asthmatics do not use inhalers appropriately, which results in improper drug distribution to lung and minimized clinical performance and symptom control.

The wrongful MDIs application is especially alarming because it leads to more asthma assaults, more visits to emergency rooms, or bad adherence to drugs. Some of the most common telltale signs are inhaling when it is not needed, inhaler: not shaking it, incorrect counting and inability to synchronize inhalation with placement of the actuation. It can thus be said that steps to improve inhaler technique are crucial in effecting the ideal management of asthma medications, symptom control and also making asthma-patients have better lives.(2)

1.3 The Community Pharmacists Role in Patient Education

The role of Community Pharmacists in the Improvement of Inhaler Technique in people with Asthma

There has been a growing importance of involving community pharmacists in the education and management of patients and especially in chronic disease management (like asthma). Pharmacists are very approachable healthcare experts, who have an extensive knowledge base dealing with pharmacology, pharmacotherapy management, as well as patient advising. By virtue of their ample contact with patients, they can offer an excellent opportunity to detect a problem with medication use, provide advice on correct use of inhalers, and provide reinforcement of treatment adherence.

Education on using inhalers by a pharmacist is also known to produce improvements in how well patients use their inhalers culturally, hence control their asthma. The pharmacists can also follow up and assess patient progress and offer such follow up sessions so that methods are fitted in the long term. They are not only instructors but also assistance in empowering patients and answering their concerns and assisting in the regular use of prescribed medications so that the therapeutic despotency of inhaled medications can be obtained optimally.

1.4 Reasons and the Purpose of the Study

Although the role of correct inhaler technique has been well identified, patient education and correction of inhaler technique is lacking in many facilities and especially in a community pharmacy practice setting. The quality of asthma control is usually insufficient because of poor method and continuous education. This research investigates how effective pharmacist-led education of inhaler technique and skills to medicine users is in enhancing proper use of inhaler usage and management of asthma in the adult asthmatic patients. The trial was carried out among the community pharmacies in in Qatar and Kenya, the countries that have distinct healthcare environment with a different burden of asthma, to answer whether pharmacist education has the opportunity to reduce the current gaps in training of the inhaler technique.(3)

The study aims at achieving the following objectives:

- Evaluate the current rate of proper inhaler technique of the asthmatic patients.
- Test how well one-on-one pharmacist led inhaler technique training succeeds at improving technique.
- Assess the changes of asthma control, such as the improved Asthma Control Test (ACT) scores and decreased short-acting 2-beta-agonist consumption.
- Identify the maintenance of better technique and control of asthma during a 4 week follow-up.

This paper also seeks to explain why it is important that community pharmacists should get involved in enhancing the use of the inhaler technique in order to create a better result in managing asthma and thus making patient care and the burden of asthma to be less.

2. Site context and Study Design

2.1 Type and Duration of the study

It was a multicentred interventional pilot study carried out to determine the effectiveness of pharmacist-delivered education on enhancing use of mist inhalators in patients with asthma using their metered-dose inhalers (MDIs). The study was made of a prospective interventional study in which they enrolled the participants in which they received individual training in the inhaler technique by trained community pharmacists. This was preceded by a 4 weeks follow up period, during which the success of the educational procedure in enhancing the inhaler technique and asthma management was determined.(4)

The 4 weeks were established as the study period, where the measurements were taken at the very beginning and after the follow-up visit. This period was long enough to be able to assess the changes in technique of using inhalers and asthma control, including the use of short-acting 2-agonist (SABA) and Asthma Control Test (ACT) scores. The design of the study was chosen to assess the long-term effect of the study since the question is reducing the occurrence of inhaled medications and asthma control over a sustained period of 14 weeks to achieve an exponentially long-term effect.

2.2 Geographic and institutional setting

The research work was carried out within two different geographical areas, Qatar and Kenya, which set the analyses in the multinational context of the research outcomes measuring efficiency of education on the inhaler technique. The list of countries was chosen due to the factors of high asthma burden and the variety of healthcare settings existing in each one. Qatar is a high-income, an urban medical environment with easy access to modern healthcare amenities whereas Kenya is a lower middle incomes country with mixed healthcare accessibility, especially in rural regions. This variety created a chance to evaluate the generalizability of interventions with the help of pharmacists to various healthcare settings.(5)

The research carried out in both the countries community pharmacies. The study was conducted in community pharmacies in the urban environment of Qatar, whereas in Kenya, urban and rural community pharmacies were used to obtain a larger sample of the population of patients. The reason behind selecting these pharmacies was the high foot traffic of individuals with asthma and the presence of trained community pharmacists who could definitely provide the intervention.

2.3 Inclusion Criteria of the Participants

Adult patients (those aged 18 years and above) with asthma, and those already taking metered-dose inhalers (MDIs) in order to treat their condition, were also included in the research. The participants were included according to the following inclusion criteria:

- Age Aged 18 years or more
- Clinical determination and diagnosis of asthma by a health practitioner.
- The present metered-dose inhaler (MDI) application in asthma treatment
- Incorrect inhaler technique at baseline, where patient has a suboptimal inhaler technique (i.e. does not go through the correct steps in using the inhaler correctly according to standard protocols of inhaler technique tests).
- Availability of information to give an informed consent to join the study

Patients who were able to meet the inclusion criteria were asked to participate and offered to sign the informed consent before being enrolled. Exclusion criteria These were:

- Severe asthma or referral to hospital because of recently delayed exacerbation
- Mental incapacity or a disorder which was an impediment to follow instructions or give concurrence
- Existing enrollment in other clinical trials that can interfere with the management of asthma or training on the use of inhalers

Limiting the study to adult asthmatic patients who use MDIs, the authors wanted to address the question on the efficacy of the pharmacist-led knowledge assessment with the most prevalently used asthma management inhalation device, MDIs.(6)

3. Training and Educational Intervention on pharmacists

3.1 The Methodology In Training Pharmacists

The pharmacists included in this research were trained in a special way to allow continuity and success in teaching the use of inhalers. The training program was set out in such a way that would enable the pharmacists to be equipped with right knowledge and skills which would enable them impart patient centered education, evaluate the inhaler technique and give a sensible recommendation to make improvements.

The training involved the following :

1. **Inhaler Technique Mastery:** Pharmacists were made fully conversant with the appropriate usage of the metered-dose inhalers (MDIs) on each one of the components of the technique, which includes:
 - Insect shake the inhaler before utilizing it
 - Proper use and movement of the inhaler
 - Slow, deep and convulsive breathing plus a pause (inhalation technique)
 - The processes of exhalation and breath-holding to maximize the deposition of the drug in the airways
 - The process of coordination of the actuation process and inhalation process
2. **Patient Education Techniques:** Pharmacists were prepared with skills on how to communicate effectively so that they could inform their patients on how to use the Inhaler, and how to transfer important information to them in an easy way. In this training, the emphasis was made on the active listening skills, patient concerns, and non-judgmental attitude, which should allow connecting with the patient.(7)
3. **Assessment and Monitoring:** The pharmacists were taught to evaluate techniques in the use of the patients with a standardized checklist and to determine the usual errors of inhalers. They were also given knowledge on how to provide positive remarks and suggestions on proper use of inhalers.

The role of Community Pharmacists in the Improvement of Inhaler Technique in people with Asthma

4. **Follow-up Strategies:** The pharmacists were also trained in follow up methods and this way ensured that the patients enjoyed continual treatment. Follow-ups were arranged after 4 weeks of the intervention during which time re-evaluation of technique and control of asthma would have probably taken place.

3.2 The Protocol of Patient Education

The patient education program was created in order to guarantee that patients are structurally, clearly, and practically trained about how to use their inhalers adequately. Intervention took place at individual education session between the pharmacist and the patient realized as a one-on-one session lasting about 20-30 minutes.

The meeting contained:

1. **To evaluate inhaler technique:** An inhaler technique for each patient has been evaluated with a standard check-list. The pharmacist monitored the patient using the inhaler and gave comments in case of errors.
2. **Step-by-Step Training:** The pharmacist presented the proper technique of using an inhaler, demonstrating each of the steps and performing explanations of how to use the device. The patients were advised to practice the technique by themselves with supervision so as to understand and recall the technique.
3. **Patient-Centered Counseling:** Pharmacists discussed the personal issues, gave some individual explanations, and gave the cases about correcting the technique. They also talked about the importance of using an inhaler properly, namely a good drug delivery and control of asthma.
4. **Practicing the inhaler technique:** The practice was as follows after demonstrating the technique, the patients practiced the step under the supervision of a pharmacist getting feedback immediately to address any error still.
5. **Patient education:** Patients received written instructional input, such as step by step instructions, visual aids to support proper use of an inhaler. These materials were developed in accordance with the language and level of literacy of this patient.

3.3 Some Tools of Intervention

To guarantee successful intervention, the following tools were applied to make the delivery and follow-up effective(8)

- **Inhaler Technique Checklist:** A systematic checklist was chosen to report and record the inhaler technique of each patient at the baseline and on the follow-up visit. The tool assisted in the identification of errors that were commonly made and these errors were dealt with in the educational session.
- **Patient Education Pamphlets and Visual Aids:** The patient education pamphlets include clear instructions about the use of the inhaler, a visual diagram, and trick to avoid the most frequent mistakes. These resources were provided in the local language, and they came with the instructions of using MDI and with the best issues of storage and maintenance.
- **Asthma Control Test (ACT):** The questionnaire used to determine asthma control was the ACT questionnaire which was used twice before and after the intervention. This instrument assisted in monitoring the developments involved in the control of symptoms and also gave information on the way patients controlled their asthma following the intervention.
- **Follow-up Calls/Visits:** Pharmacists again evaluated the effect of the patient inhaler technique and asthma management at the 4-week follow-up and offered further advice to the patient in case of any problems. A follow-up questionnaire which consisted of a short version was conducted to determine whether or not the development in technique was maintained.(9)

4. Monitoring and Evaluations Measures

4.1 Parameters of Baseline Evaluation

At the beginning of the study, a complete baseline assessment was done to determine the initial inhaler technique and the asthma control and general implementation of medication of the participants. An important parameter that was measured as baseline included:

1. **Inhaler Technique:** The first technique in the use of inhaler was measured with the aid of a standard checklist that involves the detection of the common mistakes in the use of metered-dose inhalers (MDIs). The pharmacist monitored the patient to use the inhaler; he/she paid attention to whether the patient did the following important steps:
 - The proper way of shaking the inhaler

- Synchronising actuating and breathing
- Retention of the breath held in after respiration
- Correct placement of the inhaler

The proportion of the patients showing proper use of the inhaler would be noted and the errors will be recorded so that they can be attended to in the future.(10)

2. **Symptom Control:** The symptom control was measured by the application of the Asthma Control Test (ACT). This instrument assesses the five major symptoms related to asthma which are daytime symptoms, night-time symptoms, short-acting 2-agonists (SABA) use, activity limitations, and control of asthma. The ACT questionnaire scores were used to give a baseline asthma control measure to every patient.
3. **Short-Acting β 2-Agonist Usage:** The number of SABA dosed within the last 2 weeks was determined. The use of SABAs is frequently used to signify the lack of asthma control, and the frequency can be used to gauge the magnitude of the symptoms and the efficiency of the long-term management of asthma.
4. **History of Medications:** The history of medications that patients are currently taking regarding both long-term control medications as well as relievers was also recorded as a means of getting a proper insight into the path of the treatment process as well as where it may be optimized.

4.2 Follow-Ups of Intervention

The follow-up assignment was developed 4 weeks after the drugstore-based education, including the following major parameters:

1. **Improving the Inhaler Technique:** The inhaler technique of the participants was also re-evaluated by relying on the same checklist that was applied during baseline. The pharmacist was able to watch the patient as he or she used the inhaler and detected any mistakes. Change in technique was assessed by the comparison of baseline-following results and the right technique was re-examined. It was anticipated that there would be substantial increment in the number of patients who show proper use of an inhaler, as earlier noted in the previous works of inhaler education.
2. **Asthma Control:** At follow up visit the ACT will be readministered to determine whether asthma control has improved or not. The positive change on the ACT score was associated with more appropriate management of asthma, fewer asthma symptoms, and decreased reliance on emergency medications.
3. **Short Acting Beta 2- Agonist use:** At the follow up, the frequency of using SABA was reviewed to establish the change in the occurrence of asthma exacerbation or use of rescue medicines. There would be a use of less SABA medication implying a greater control over the asthma problem in general, which will be due to the less imperfect inhaler technique and better medication compliance.(11)
4. **Patients satisfaction and feedback:** After the educational module, participants had also to fill out a satisfaction survey, which comprised questions regarding their knowledge about the use of inhalers, their feelings about how well they know their inhaler, and their experience with the training delivered by the pharmacist. This qualitative input was appropriated to determine the acceptability of the intervention and how it would have an influence on the engagement of patients.

4.3 Data Analysis and Collection of Graphs

Baseline data were measured along with 4 weeks after the intervention. The major data points were:

- Correct inhaler technique: Percentage of patients with correct technique at baseline and follow up
- ACT scores: improvements in asthma control pre and post intervention
- SABA use: short-acting β 2 -agonist application frequency of baseline and follow-up

The statistical analysis was made with the help of SPSS (version 25). They summarized the description of the baseline characteristics, such as age, gender, and medication consumption using descriptive statistics (mean plus standard deviation). Paired t-tests were run to compare the changes in the inhaler technique, ACT scores and SABA administration between the baseline and the post-intervention. A $p < 0.05$ level of statistical significance was introduced. Further, chi-square tests were also used in comparing the categorical variables like correctness of inhaler technique at baseline and follow-up. Effect size was also determined in measuring the improvements in technique and asthma control size.(12)

5. Results

5.1 Improvement Outcome of Inhaler Technique

One of the objectives of the intervention was to enhance the correct technique use of the inhaler in case of asthma patients. Even at baseline, the ratio of patients displaying the proper method was at 28.3%, which matches the results of previous studies that the situation with using inhalers correctly was critical. But, taking 4 week follow up of pharmacist led inhaler education the percentage of patients illustrating proper inhaler technique rose tremendously to 82.5 percent ($p < 0.001$). This 54.2 percent increment implies that the influence of the teaching offered by the community pharmacists in the correct use of inhalers is significant. The change was the same in both sites of study showing that the intervention was successful in other healthcare settings.(13)

Table 1: Inhaler Technique Improvement

Assessment Time Point	Correct Inhaler Technique (%)	Improvement (%)	p-value
Baseline	28.3%	-	-
Follow-Up (4 weeks)	82.5%	54.2%	< 0.001



Figure 1: Inhaler Technique Improvement

The outcome of this finding indicates that direct pharmacist-based inhaler technique education is an excellent intervention when it comes to enhancing inhaler use among asthmatics and this can directly translate to improved medication delivery and asthma management.

5.2 Alterations in the scores of Asthma Control Test

Along with the inhaler technique, the study also evaluated the effect that the intervention had on asthma control, using the Asthma Control Test (ACT). The average ACT score (14.514.5) at baseline of the intervention group was positive. Any score above 19 denotes a well-controlled asthma whereas any score below 15 denotes poorly controlled asthma. At the 4-week follow-up, the mean ACT score increased significantly to 19.227.1 ($p < 0.001$), which is an indication that the intervention had improved the asthma control in the patients, as patient-reported outcome measure.(14)

Table 2: Changes in ACT Scores

Assessment Time Point	Mean ACT Score $\pm$ SD	Improvement (%)	p-value
Baseline	14.5 $\pm$ 3.1	-	-
Follow-Up (4 weeks)	19.2 $\pm$ 2.7	32.4%	< 0.001

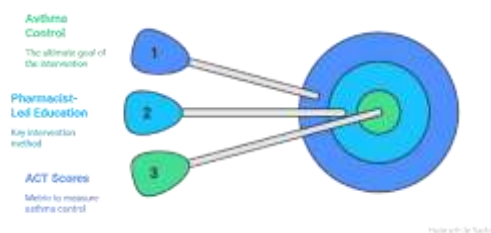


Figure. 2: Changes in ACT Scores

The increase in ACT is a sign that the knowledge and practice of the use of the inhaler was associated with better management of asthma resulting in a decrease in symptoms, reduction of dependency on rescue drugs and further improvement of the patient to manage asthma himself.

5.3 Comparative findings Site-Wise

The research was done in two geographical unique locations Qatar and Kenya where diverse healthcare conditions were different. Though both the sites had remarkable improvement in inhaler technique and ACT score, there were certain noticeable dissimilarities between the sites.

Qatar In Qatar where the healthcare system is more centralized and developed the baseline technique of inhaler usage of the patients was measured slightly higher (32.5%) than in Kenya. Immediately after the intervention, there was a marginally better improvement rate in Qatar whereby 86 per cent of patients showed proper inhaler technique at follow-up.(15)

Kenya: In Kenya, the relative resources of the healthcare systems are weaker and baseline technique was lower (24.1 percent) and a small percentage of patients use their inhalers correctly. Nevertheless, the Kenya improvement was also significant as 79 percent of patients showed proper technique on follow-up, thus confirming the effectiveness of pharmacist-led interventions even in a scenario with limited resources.

Table 3: Site-Wise Comparative Findings

Site	Baseline Technique (%)	Follow-Up Technique (%)	Improvement (%)	p-value
Qatar	32.5%	86%	53.5%	< 0.001
Kenya	24.1%	79%	54.9%	< 0.001

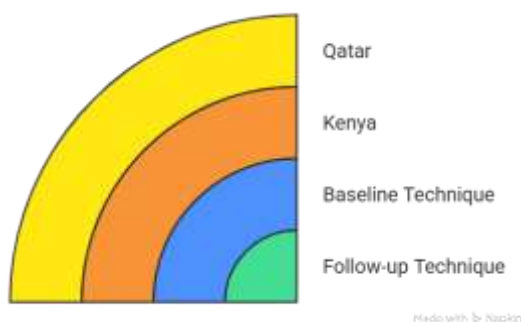


Figure. 3: Site-Wise Inhaler Technique Improvement

These results imply that community pharmacists can effectively administer pharmacist-led inhaler education across various healthcare facilities and that the process of teaching inhaler technique can vastly benefit from the point of view of a community pharmacist than any other medical professional in a range of geographical and infrastructural backgrounds. The positive results in the rate of improvement of the conditions in both sites are

The role of Community Pharmacists in the Improvement of Inhaler Technique in people with Asthma

indicators of the universality of the intervention towards the improvement of the management of asthma irrespective of the healthcare location.

6. Conclusion

6.1 Overview of Conclusions

This pilot study conducted in a multinational setup was indeed successful in showing how community pharmacists can have a significant effect on bettering the inhaler technique and in asthma management among adult patients with asthma. Before the intervention, 28.3 percent of the patients showed a correct inhaler technique. Nevertheless, during an educational program conducted by pharmacists, this value increased to 82.5% ($p < 0.001$) or an increase in inhalator technique of 54.2%. Also, the Asthma Control Test (ACT) improved considerably with the increase of 14.5 ± 3.1 at baseline to 19.2 ± 2.7 ($p < 0.001$) which means better asthma control, and improvements in the symptoms. It was also found out that the short-acting β_2 -agonist (SABA) was also reduced and this led to the thought that better inhaler technique had led to effective long Michael E. Stapleton period control.

The success of the intervention in various geographic settings was also mentioned in the study. In Qatar, there was a marginal improvement in the inhaler technique (That is, the technique increased by 32.5 percent and 86 percent) whereas in Kenya, there were also considerable changes such that the technique changed by 24.1 percent and 79 percent. These findings are indicative of the generalization of pharmacist led interventions in asthmatic management irrespective of healthcare infrastructure.

6.2 Clinical and Public Health Implications

The clinical and the public health implications of the study findings are vast. One is the health outcome of this intervention as it is the result of using the inhaler properly, which translates to more effective administration of asthma medications in the lungs. This improves drug deposition leading to improved asthma control, fewer symptoms and exacerbations. Poor adherence to inhaler use is one of the greatest problems in controlling asthma as it usually results in ineffective asthma control, more healthcare service use, and higher expenses. When this problem is tackled through the education of pharmacists, much better clinical outcomes in the management of asthma can be achieved that translates to fewer hospital visits and emergency care visits due to exacerbations.

Pharmacist-led inhaler technique teaching is the cost-effective approach to enhancing a population level of asthma management as interpreted through a lens of public health. Since community pharmacists are very accessible healthcare professionals, they occupy a prime spot to deliver extensive inhaler technique training and asthma management. This way will help to decrease healthcare disparities, especially in under served regions where there may not be much access to specialist respiratory care. More so, the role of pharmacists in asthma management may result in the reduction of healthcare costs associated with potential unnecessarily exacerbations and hospitalizations.

6.3 Future research recommendations

Although the present study has encouraging findings, there exist specific areas that should be studied further. Further investigations are also necessary to consider greater sample sizes and follow-ups to determine whether the enhancement of inhaler technique and asthma control can be sustained. Also, the study needs to address issues of cost-effectiveness of pharmacist-directed asthma care in various healthcare facilities, and resource-restricted settings.

The effects of the pharmacist-led interventions on patient quality of life and adherence to medications and barriers to implementation in various geographical and cultural domains could be a study topic too. What is even more, comparing the results of pharmacist-led interventions with other forms of medical professionals providing services, like telehealth-based inhaler education, would prove valuable in determining how scalable and effective these educational strategies are.

Lastly, a potential future research direction would be the incorporation of pharmacist-led education as a usual activity in all the programs regarding asthma management and populations in primary care, comparing the effect of such activity on influencing health of the respective populations and prevailing asthma levels.

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Conflicts of interest

The authors have no conflicts of interest to declare

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