



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE
SCHOOL OF PUBLIC HEALTH

ASSESSMENT OF PRACTICE OF ADMINISTRATION AND
PROVIDING EDUCATION ON CORRECT USE OF
INHALERS TO ASTHMATIC PATIENTS AMONG SAINT
PAUL'S MEDICAL INTERNS

BY
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Acronyms and Abbreviations

Df: Degrees of Freedom

DPI: Dry Powder Inhaler

ETB: Ethiopian Birr

KAP: Knowledge, Attitude, and Practice

MDI: Metered Dose Inhaler

P-value: Probability Value

SABA: Short Acting Beta Agonist

SD: Standard Deviation

SPHMMC: Saint Paul's Hospital Millennium Medical College School of Public Health

SPSS: Statistical Package For The Social Sciences

WHO: World Health Organization

χ^2 : Chi-Square Test

Abstract

Asthma, a common chronic disorder of the airways, is a major global health problem affecting 339 million people worldwide, with death cases accounted for asthma were estimated to be around 460,000. It is a growing public health concern in Ethiopia, where rates of uncontrolled asthma remain as high as 71.67% due to factors such as poor inhaler technique.

Inhalation therapy is the main method of asthma management; however, improper use of devices such as metered dose inhalers (MDIs) and dry powder inhalers (DPIs) continues to limit treatment effectiveness. Medical interns, as one of the primary healthcare providers, play an important role in administering inhalers and educating patients on correct use. Despite this, little is known about their competence, confidence, and teaching practices regarding inhaler use in Ethiopia.

Objective

This study aimed to assess the practice of Administration and providing education on correct use of inhalers to asthmatic patients among Saint Paul's medical interns

Methods

A cross-sectional design was employed, using a structured questionnaire and observation checklist to evaluate 90 of Saint Paul's interns' practice with MDIs and DPIs. The study population was based on the medical Interns currently enrolled at SPHMMC 2017 E.C. The study period was from August to December 2025. Data was analyzed using SPSS, with results used to analyze their levels of practice.

Results

The results showed that from the 90 interns participating in the study, 40% of interns demonstrated poor MDI practice, 50% demonstrated poor DPI practice, and 55.6% demonstrated poor patient education practice. 36.7% of interns had poor knowledge, while 80% had a positive attitude. There was a significant association of knowledge with practice. Attitude was not significantly associated with practice, despite its generally positive level.

Conclusion and Recommendation

In conclusion, this study demonstrates that while medical interns at SPHMMC generally have positive attitudes toward inhaler use and patient education, significant gaps exist in knowledge and, more importantly, in practical skills. Knowledge was the strongest predictor of correct practice, whereas attitude alone was insufficient. It could be recommended that SPHMMC addresses these problems by incorporating practical inhaler training and regular competency assessments into internship curricula which may improve both technique and patient education practices, which will result in better asthma care and patient outcomes in Ethiopia.

Keywords

Metered-dose inhaler (MDI), Dry powder inhaler (DPI), Patient education, Medical interns, SPHMMC, Practice.

1 Introduction

1.1 Background

Asthma can be defined as a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyper responsiveness, and underlying inflammation(National Asthma Education and Prevention Program, 2007).

It affects approximately 339 million people worldwide, with death cases accounted for asthma were estimated to be around 460,000. The prevalence of bronchial asthma in Ethiopia is a significant public health concern, with studies reporting rates around 9% in adults with rates of uncontrolled asthma reported as high as 71.67% in one systematic review and meta-analysis (Tadesse et al., 2020). In 2020, Asthma was estimated to cause 8.13 deaths per 100,000 individuals in Ethiopia, ranking 25th among the top causes of mortality in the country.(*Asthma in Ethiopia*, n.d.).

Inhalation therapy remains the cornerstone of asthma management, with inhalers delivering medications directly to the airways to achieve rapid relief and control of symptoms. Despite the availability of inhalers, poor technique among medical personnel and patients remains a widespread issue, directly contributing to inadequate emergency management, suboptimal control of symptoms, and unnecessary hospital visits.

International studies have shown that when healthcare providers such as medical interns are adequately trained to administer inhalers and educate patients, asthma outcomes dramatically improve. Based on review of related literature it was found that research on the topic in the surrounding area has been found to be lacking.

The research aimed to assess the practice of these medical personnel in administering inhalers as well as on educating patients on the proper use. In particular, it aimed to focus this topic on the medical interns currently enrolled in SPHMMC 2017, E.C

1.2 Statement of the Problem

Asthma, a common chronic disorder of the airways that is characterized by variable and recurring airflow obstruction symptoms, can be managed effectively with the correct use of inhalers (*Asthma*, n.d.) such as metered dose inhalers (MDIs) and dry powder inhalers (DPIs). However, improper administration techniques can significantly impact the effectiveness of the medication and can lead to rates of uncontrolled asthma as high as 45% in Ethiopia (Mulugeta et al., 2022).

The high rates of uncontrolled asthma can have serious consequences. They can have clinical impacts such as increases exacerbations, chronic symptoms, reduced lung function, and increased mortality. It will result in higher healthcare costs due to frequent hospital visits, as well as leading to loss of productivity in school and work activities (Yaghoubi et al., 2019). There will also be an impact on the mental health of the patients.

The most common factors of uncontrolled asthma were due to incorrect inhalation techniques, as well as other causes such as frequent SABA use, moderate/severe persistent asthma, history of exacerbations, presence of comorbidities, use of oral corticosteroids, and irregular follow-up (Mulugeta et al., 2022).

Saint Paul's Hospital is one of the leading figures of healthcare in Ethiopia, treating a variety of cases daily. The medical interns represent a key group of healthcare professionals who frequently administer and prescribe MDIs and DPIs. Yet there was limited data assessing the interns' clinical habits concerning inhaler administration and patient education. Understanding their practical skills with MDIs and DPIS is essential for ensuring optimal patient care, as well as for preventing further exacerbations.

1.3 Rationale /Justification of the study

Asthma is a leading cause of preventable hospital visits and deaths, especially in low-resource settings. Correct inhaler use is essential for effective asthma control. Poor handling of inhalation devices and wrong inhalation techniques are associated with decreased medication delivery and poor disease control. In Ethiopia, rates of the uncontrolled asthma were 45.0%, with only 19% of the asthma patients had a well-controlled asthma (Mulugeta et al., 2022).

Assessing the current level of practices among Saint Paul's medical interns is important for several reasons. First, it highlights the readiness of these interns to manage a common chronic condition like asthma effectively. Second, identifying gaps in their practice can guide the development of targeted interventions such as curriculum updates, seminars or hands-on training programs. Third, improving interns' competence in this area can lead to better patient education, adherence to treatment, and ultimately better asthma outcomes in the population.

The findings of this study can provide valuable insight into whether the current medical education and clinical training sufficiently give interns the necessary skills to manage asthma appropriately, particularly in terms of inhaler administration and patient instruction.

1.4 Significance of the Study

This study holds significant importance in improving both medical education and patient care outcomes. Medical interns play an important role in managing common diseases such as asthma, especially in teaching hospitals like Saint Paul's Hospital Millennium Medical College. Their ability to correctly use inhaler devices can directly influence the quality of asthma care provided to patients.

By assessing the practice of medical interns regarding proper inhaler administration and patient education, this study aimed to identify gaps that may be affecting clinical competence. The findings will offer valuable information into whether current medical training adequately prepares interns for real-world asthma management.

The results of this study can be used by the teachers and hospital administrators to enhance teaching approaches, integrate hands-on inhaler technique training, and focus on patient education as a core clinical skill. In the long term, strengthening interns' competencies in this area may lead to better patient adherence, improved asthma control, and reduced emergency visits, thereby benefiting the healthcare system.

2 Literature Review

Effective asthma management largely depends on proper inhaler use, as inhaled medications offer direct delivery to the lungs, rapid onset of action, and fewer systemic side effects. However, correct use of inhalers among medical personnel and patients remains suboptimal globally, due to a variety of reasons.

Studies have shown that medical professionals, including doctors, pharmacy professionals, and interns, often lack sufficient knowledge or technique in administering inhalers properly. A study done by J Family Med Prim Care in 2016 Apr-Jun⁵, using a structured assessment sheet, revealed that the proficiency in using different inhaler devices amongst medical interns was poor. They scored interns on steps of identification, preparation, administration, coordination, and patient explanation using a 0–5 scale, in addition to cataloguing common errors such as failure to shake MDIs or inadequate breath-holding. Seventy-nine percent of the interns could prepare an MDI appropriately, but the number dropped down to 60% when the MDI was combined with a spacer (Kshatriya et al., 2016).

A questionnaire-based cross-sectional study among 70 undergraduates and residents at a tertiary hospital in Nepal, 2022 revealed that while knowledge about inhaler therapy varied, only about 41% routinely educated patients on technique, underlining a gap in practical application. 79% and 82% responded with the correct method of the administration of the DPIs and MDIs respectively. (Shrestha et al., 2022).

A study done in Ethiopia showed worse results. A cross-sectional study was employed on pharmacy professionals working in community drug retail outlets in Gondar town, northwest Ethiopia from March to May 2017. Evaluation tool was originally taken and adapted from the National Asthma Education and Prevention Programmes of America (NAEPP) step criteria for the demonstration of a metered dose inhaler to score the knowledge/proficiency of using the inhaler. Among 70 community pharmacy professionals approached, 62 (32 pharmacists and 30 druggists/Pharmacy technicians) completed the survey with a response rate of 85.6%. Only three (4.8%) respondents were competent by demonstrating the vital steps correctly (Belachew et al., 2017).

A similar study was conducted among registered pharmacists and druggists from different public and private pharmacies and drug stores in Mekelle Town, Ethiopia from March to June 2013. Of the 106 professionals who took part in this research, based on the competency on essential steps for optimum therapeutic value of MDI, only 2 (1.8%) study participants had adequate competency in metered dose inhaler (Ali et al., 2014).

Another cross-sectional study conducted at St. Paul's Hospital Millennium Medical College among nurses, residents and interns working in the department of pediatrics assessed the knowledge and practice of the providers' MDI techniques in children from April 2021 to August 2021. A total of 143 pediatric providers (nurses, residents and interns) were included in the study. Among the healthcare providers, only 81 (57%) had good knowledge on MDI medication administration techniques in children and practice of inhalation was 95 (66%) (Weldetsadik & Worku, 2024).

Despite the available research, there are some gaps seen, such as the relative lack of any research on medical interns done in the country, Ethiopia. Most of the data available focuses on other healthcare professionals and patients. This gap in the literature shows the need for focused research to evaluate the competencies of medical interns in this area, given that they are often required to prescribe and administer inhalers. Identifying any practice shortcomings can help design targeted interventions, including curricular improvements and practical training seminars aimed at enhancing asthma care delivery in SPHMMC and similar healthcare settings.

3 Objectives of the study

3.1 General Objective

The general objective of the study was to assess the practice of Administration and providing education on correct use of inhalers to asthmatic patients among Saint Paul's medical interns.

3.2 Specific Objectives

The specific objective of the study was:

- To observe and analyze the practical skills of SPHMMC medical interns in correctly using inhalers and in educating patients, as well as the associated factors.

4 Methods and Materials

4.1 Study Design

This study used a cross-sectional study design to assess the practice among the SPHMMC medical interns of batch 2017 E.C, on Proper Administration and providing education on correct use of inhalers to asthmatic patients. A cross-sectional design was selected for this study, because it would help assess the target population at a single point in time. This identified the current gaps and can aid in planning for future interventions.

4.2 Study Area

The study was done at St. Paul's Hospital Millennium Medical College (SPHMMC), located in Addis Ababa, Ethiopia. SPHMMC is one of the largest teaching Hospitals in Ethiopia that gives medical care for different illnesses, while providing education for the different students attaching at their various clinical attachments. The hospital was an ideal site for the study, because it exposes interns to a wide range of clinical conditions, including asthma and other respiratory diseases.

4.3 Target Population

The target population of the study involved the medical interns in Ethiopia 2017 E.C

4.4 Study Population /Source Population

The study Population /Source population was based on the medical Interns currently enrolled at SPHMMC 2017 E.C

4.5 Study Period

The study was held from August to December 2025

4.6 Inclusion Criteria

The research had the following inclusion criteria:

1. Medical interns currently enrolled at SPHMMC, 2017 E.C.
2. Interns who had completed clinical rotations in relevant departments (e.g., internal medicine, emergency, pediatrics, or outpatient).
3. Those who voluntarily consented to participate in the study.

4. Interns who were available during the data collection period.

4.7 Exclusion Criteria

The research had the following exclusion criteria:

1. Medical interns who were not present at SPHMMC during the data collection period.
2. Those who refused to give consent.
3. Participants who did not fully complete the questionnaire or provide inconsistent responses.

4.8 Sample Size

The available population for this study was the 93 medical interns currently attached and enrolling at SPHMMC 2017 E.C. Because the population was small, the sample size consisted of 90 medical interns currently attaching and enrolled in SPHMMC 2017 E.C.

4.9 Sampling Technique

Since the study used all the 93 medical interns, a census of the population was done, and sample size calculation was not done.

4.10 Variables of the Study

4.10.1 Dependent Variables

The research had the following dependent variables:

- Practice of administering inhalers and patient education

4.10.2 Independent Variables

The research had the following independent variables:

- Age
- Gender
- Internal Medicine/ Emergency medicine attachment completed
- Previous training on inhaler use
- Frequency of prescribing or demonstrating inhalers
- Access to inhaler devices for practice
- Knowledge of proper inhaler administration
- Attitude toward the importance of proper use and patient education

4.11 Operational Definition

SPHMMC Medical Interns: The medical interns currently enrolled and attaching in their final undergraduate year at SPHMMC.

Asthma: a common chronic disorder of the airways that is complex and characterized by variable and recurring symptoms, airflow obstruction, bronchial hyper responsiveness, and an underlying inflammation.

Acute Exacerbation of Asthma: Is the exacerbation or worsening of asthma symptoms, usually identified by clinical signs or symptoms or by spirometry.

Metered Dose Inhaler: Is a device that delivers a specific amount of medication to the lungs in the form of a short burst of aerosolized medicine using a propellant. They are commonly used for respiratory conditions like asthma and COPD A standard MDI has the following parts(*Standard Components of a Pressurized Metered-Dose Inhaler. (From... | Download Scientific Diagram, n.d.):*

- Canister: A small metal container that holds the medication (drug + propellant). The medication is released when the canister is pressed.
- Metering Valve: Is attached to the canister. It controls and delivers a fixed, measured dose of the medication with each press.
- Actuator: The plastic holder that houses the canister.
- Mouthpiece: The site from which the aerosolized medicine is inhaled.
- Dust cap: A removable cover that protects the mouthpiece from dust .

Metered Dose Inhaler Administration Steps: Are the general steps for how to use a metered dose inhaler:

1. Take off the cap and shake the inhaler
2. Make the patient stand up or sit up straight
3. Make the patient breathe out completely to empty their lungs
4. Place the mouthpiece in the patient's mouth and make them close their lips around it to form a tight seal

5. As they start to breathe in, press down firmly on the top of the medicine canister to release one “puff” of medicine. The patient should breathe in slowly for 3 to 5 seconds and take as big a breath as possible
6. The patient should hold their breath and count to 10
7. Take the mouthpiece out of their mouth. The patient should release their breath
8. If the action plan is to take more than 1 puff of medicine, wait 1 minute between puffs. Repeat steps 2 through 7 for each puff
9. The patient should rinse their mouth with water and spit it out. Rinsing will help to prevent an infection in the mouth such as oral thrush(Heart Lung et al., n.d.)

Dry Powder Inhaler: Is a device that delivers a premeasured dose of medication in powder form to the lung and is commonly used for respiratory conditions like asthma and COPD. They don’t need a propellant, but require the patient to inhale forcefully.

Symbicort Turbuhaler: It is a dry powder inhaler commonly used in Ethiopia. It contains two active ingredients in one inhaler: budesonide and formoterol fumarate dihydrate. It consists of the following parts:

- Mouthpiece: The part where the patient inhales the medication.
- Mouthpiece cap: Removable cover that protects the mouthpiece from dust.
- Dose indicator: Shows the approximate number of doses left in the inhaler.
- Grip: The rotatable bottom part of the inhaler. Patient twists this grip to load a dose into the inhaler before inhaling.
- Central inhaler body: Holds the powder reservoir (with budesonide + formoterol)(*Buy Symbicort Turbuhaler For Asthma Online*, n.d.).

Symbicort Turbuhaler Administration Steps: Are the general steps for how to use a symbicort turbuhaler:

1. Unscrew and remove the cover
2. Hold the inhaler upright
3. Load the dose: turn the colored base of the turbuhaler to the right as far as it will go, then twist it back to the left until it clicks.

4. Ask the patient to exhale fully away from the mouthpiece (Otherwise, the medicine becomes clumped and ineffective)
5. Place the mouthpiece between the lips and close lips tightly around it
6. Inhale forcefully and deeply through the mouth
7. Remove the inhaler from the mouth. The patient should hold breath for about 10 seconds
8. The patient should then exhale slowly away from the device
9. If another puff is prescribed, repeat from Step 3
10. The patient should rinse their mouth with water and spit out to reduce the risk of oral thrush(*How to Use a Turbuhaler*, n.d.).

Knowledge: The level of understanding a medical intern has about the correct technique of using inhalers. Measurement and scoring:

- A series of questions were asked through a questionnaire to assess the knowledge of the intern.
- A correct answer scored = 1, while an incorrect answer or “I don’t know” scored = 0
- The total score was calculated, and the results were converted into a percentage based on Bloom’s cut-off points(*Bloom’s Cutoff Categories for the Total Knowledge and Attitude Scores*. | *Download Scientific Diagram*, n.d.):
 - Good knowledge: $\geq 80\%$
 - Fair knowledge: 60–79%
 - Poor knowledge: $< 60\%$

Attitude: The intern’s belief and feelings towards the importance of proper inhaler use and providing education to patients.

- A series of questions were asked through a questionnaire to assess the attitude of the intern.
- It used a 5-point system, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.
- The results were categorized using a mean score:
 - Positive attitude: ≥ 3.5

- Neutral: 3.0–3.49
- Negative attitude: < 3.0

Practice: The ability of interns to correctly use an inhaler and educating patients.

- The practice of correctly using an inhaler was measured using a technique checklist, where it was observed if the intern was able to perform the essential steps of using an MDI and a DPI correctly.
- Correctly performed steps were scored = 1, while incorrectly performed steps were scored = 0.
- The total score was calculated, and the results were converted into a percentage based on Bloom’s cut-off points(*Bloom’s Cutoff Categories for the Total Knowledge and Attitude Scores*. | *Download Scientific Diagram*, n.d.):
 - Good practice: $\geq 80\%$
 - Fair practice: 60–79%
 - Poor practice: < 60%
- The practice of educating patients on correct inhaler use was assessed via self-report practice questions, where “yes” and “no” questions were used to assess the prior practice of the interns when educating the patients.
- Questions answered “yes” were scored = 1, while questions answered “no” were scored = 0.
- The total score was calculated, and the results were converted into a percentage based on Bloom’s cut-off points(*Bloom’s Cutoff Categories for the Total Knowledge and Attitude Scores*. | *Download Scientific Diagram*, n.d.):
 - Good practice: $\geq 80\%$
 - Fair practice: 60–79%
 - Poor practice: < 60%

4.12 Data Collection

The data for this research was collected through a pre-prepared structured questionnaire with an observation checklist developed after reviewing relevant literature, including similar studies conducted previously. Data collection was carried out by the principal investigator, and the questionnaire was prepared in English.

4.13 Data Analysis

After data collection, each questionnaire was checked for consistency and completeness. The data collected was then entered into Statistical Package for Social Sciences (SPSS) for processing and analysis.

4.14 Ethical Considerations

Approval was obtained from the Health Research Ethical Review Committee of SPHMMC. All participants of the study were given a clear explanation of the purpose of the study prior to participation. Written and informed consent was obtained from the medical interns participating in the study. To maintain confidentiality, no names or ID numbers were recorded on the questionnaires.

4.15 Dissemination of the Result

The Research results will be provided for the SPHMMC after obtaining approval from the advisors.

5 Results

5.1 Socio-demographic and Training Characteristics

This study used a cross-sectional study design to assess the practice among the SPHMMC 90 medical interns of batch 2017 E.C, on Proper Administration and providing education on correct use of inhalers to asthmatic patients. A cross-sectional design was selected for this study, because it would help assess the target population at a single point in time. This identified the current gaps and can aid in planning for future interventions.

Variable	Category	Frequency	Percent
Age in years	Mean +- S.D	25.71 +- 0.782	
Sex	Female	44	48.9
	Male	46	51.1

Table 1: Age and Sex of the Interns

As shown in the demographic data above, of the 90 interns that participated in the study, the mean age of the participants was 25.71 with a standard deviation of 0.782. This shows that the participants are from a similar age, which is unlikely to be a major confounder. Similarly, the sex of the participants is unlikely to be a major confounder, as the male to female ratio is almost equal; 51.11% and 48.89% respectively.

Response	Internal Medicine/ Emergency Medicine attachment completed	Previous Formal Training in Inhaler Use	Previously prescribed inhalers to patients	Access to inhaler devices for practice/ demonstration?
Yes	97.8%	78.9%	77.8%	16.7%
No	2.2%	21.1%	22.2%	83.3%

Table 2: Training Characteristics of the Interns

From the above displayed data, it is observed that at the time of the data collection, of the 90 participants, 97.8% have completed their Internal Medicine / Emergency attachment. 78.9 % claim to have had previous formal training in inhaler use, 77.8% have previously prescribed inhalers to patients, and 16.7% of the participants claim to have access to inhaler devices for the purpose of practicing its use or demonstration.

5.2 Knowledge of the Interns

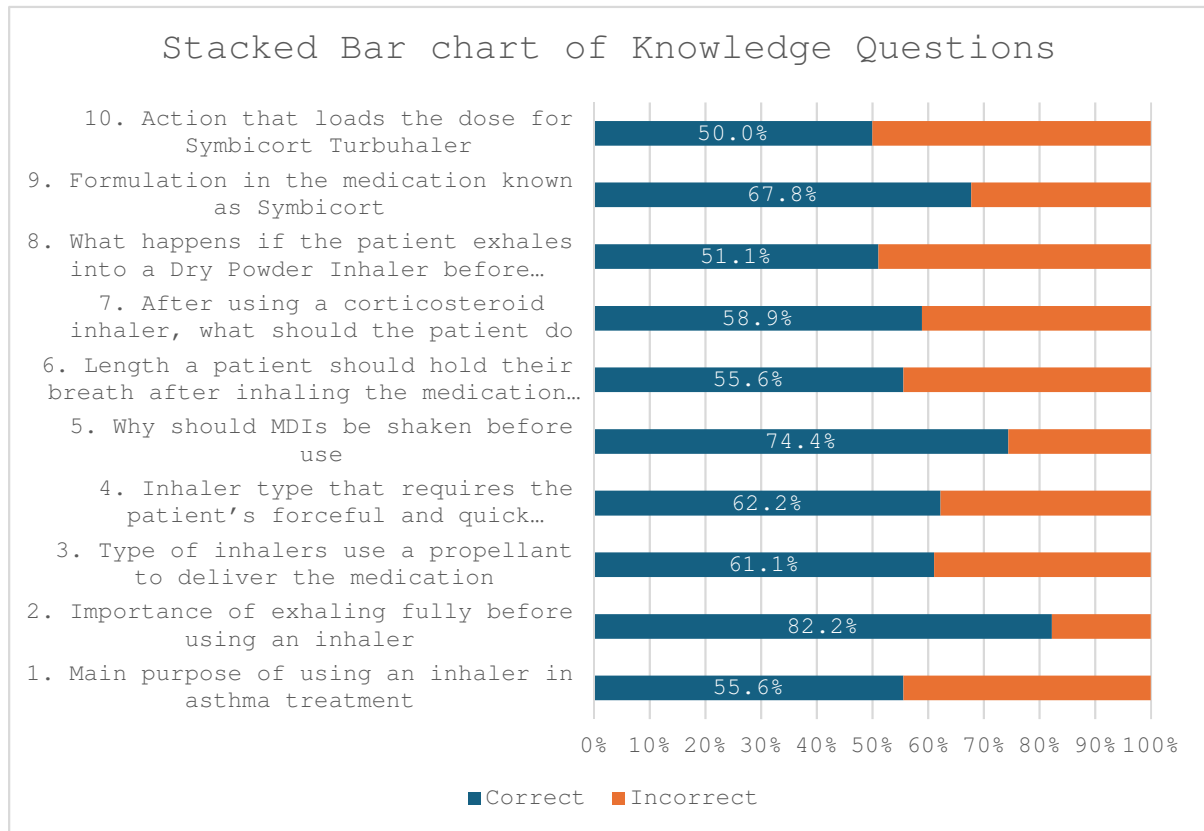


Figure 1: Stacked Bar chart of Knowledge Questions

The table and graph above show the distribution of responses to the knowledge questions. Correct responses ranged from 50% to 82.22%. The highest proportion for correct response was seen in question number 2 “The importance of exhaling fully before using an inhaler” at 82.22%, with the next highest proportions of correct answers were seen in question number 5 “Why should MDIs be shaken before use” at 74.4% and question number 9 “Formulation in the medication known as Symbicort” at 67.8%. The lowest proportion was seen in question number 10 “Action that loads the dose for Symbicort Turbuhaler” at 50%, with the next lowest proportion being question number 8 “What happens if the patient exhales into a Dry Powder Inhaler before inhaling” at 51.1% and question number 1 “Main purpose of using an inhaler in asthma treatment” at 55.6%. This shows a relatively higher knowledge proportion in the interns about metered dose inhalers, compared to dry powder inhalers.

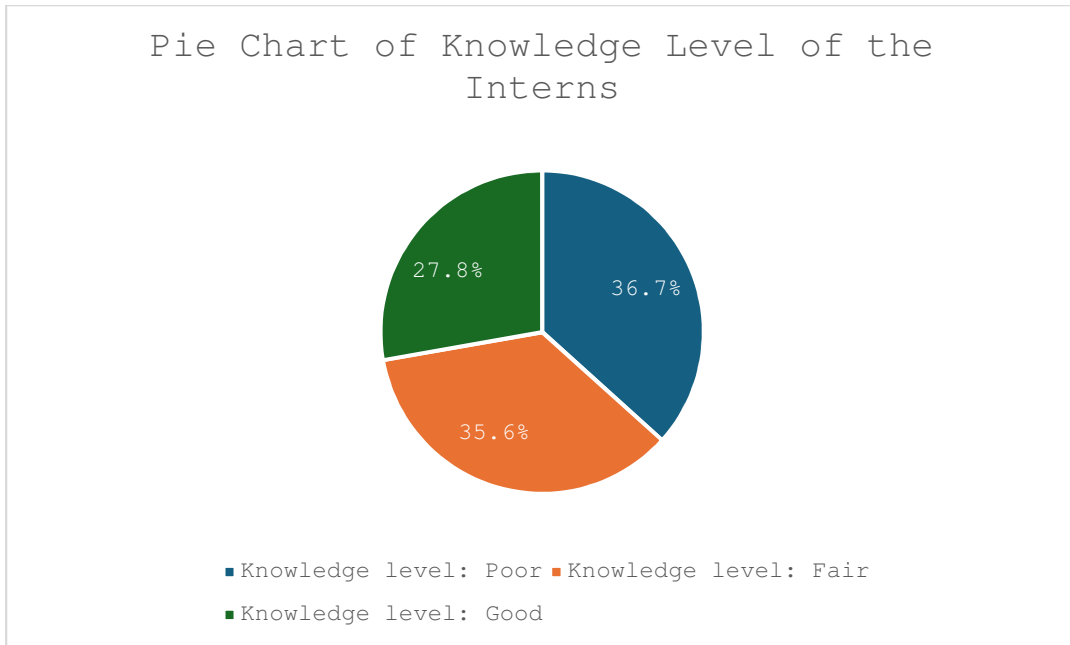


Figure 2: Pie Chart of Knowledge Level of the Interns

The knowledge levels of the interns were categorized into 3; good knowledge if responses were $\geq 80\%$ correct, fair knowledge if responses were 60–79% correct, and poor knowledge if responses were $< 60\%$ correct. From the observed data, 36.67% of the medical interns had poor knowledge, 35.56% had fair knowledge, while only 27.78% of the interns showed good knowledge on the topic.

5.3 Attitude of the Interns

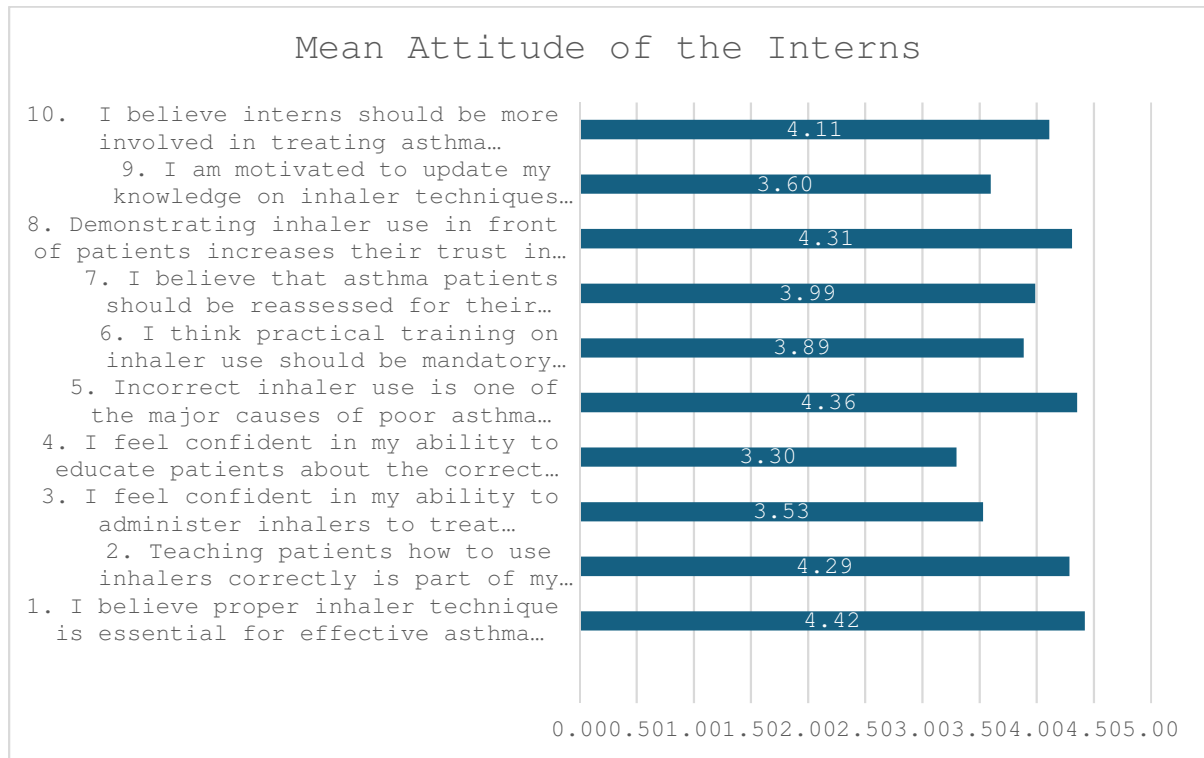


Figure 3: Mean Attitude of the Interns

The table above displays the attitude of the interns, which analyzes their belief and feelings towards the importance of proper inhaler use and providing education to patients. A 5-point system was used, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The mean attitude for each question was calculated, along with the standard deviation. The range of the values are from 3.30 to 4.42, with the lowest being question number 4 (3.30) “I feel confident in my ability to educate patients about the correct use of inhalers” and question number 3 (3.53) “I feel confident in my ability to administer inhalers to treat conditions such as asthma”. The highest mean attitude was seen for question number 1 (4.42) “I believe proper inhaler technique is essential for effective asthma management” and question number 5 (4.36) “Incorrect inhaler use is one of the major causes of poor asthma control”.

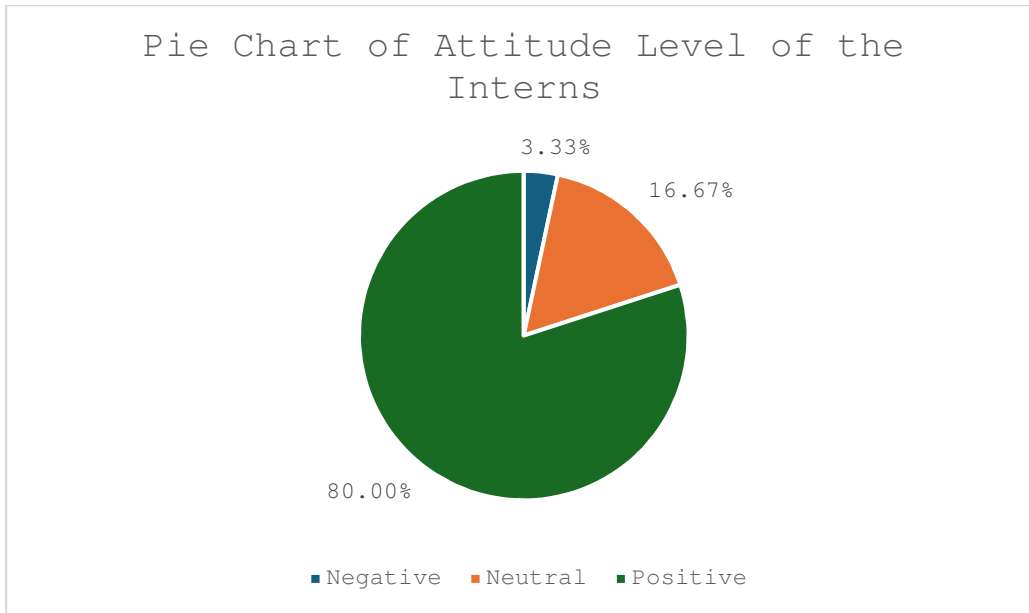


Figure 4: Pie Chart of Attitude Level of the Interns

The mean attitude score of the interns was categorized into 3; positive attitude if ≥ 3.5 , neutral attitude if 3.0–3.49, and negative attitude if < 3.0 . The above graph shows that 80% of the interns had positive attitude, 16.67% had neutral attitude, and 3.33% of the respondent interns scored in the negative attitude category, indicating a generally favorable perception among medical interns. However, social desirability bias cannot be excluded.

5.4 Practice of MDI among Interns

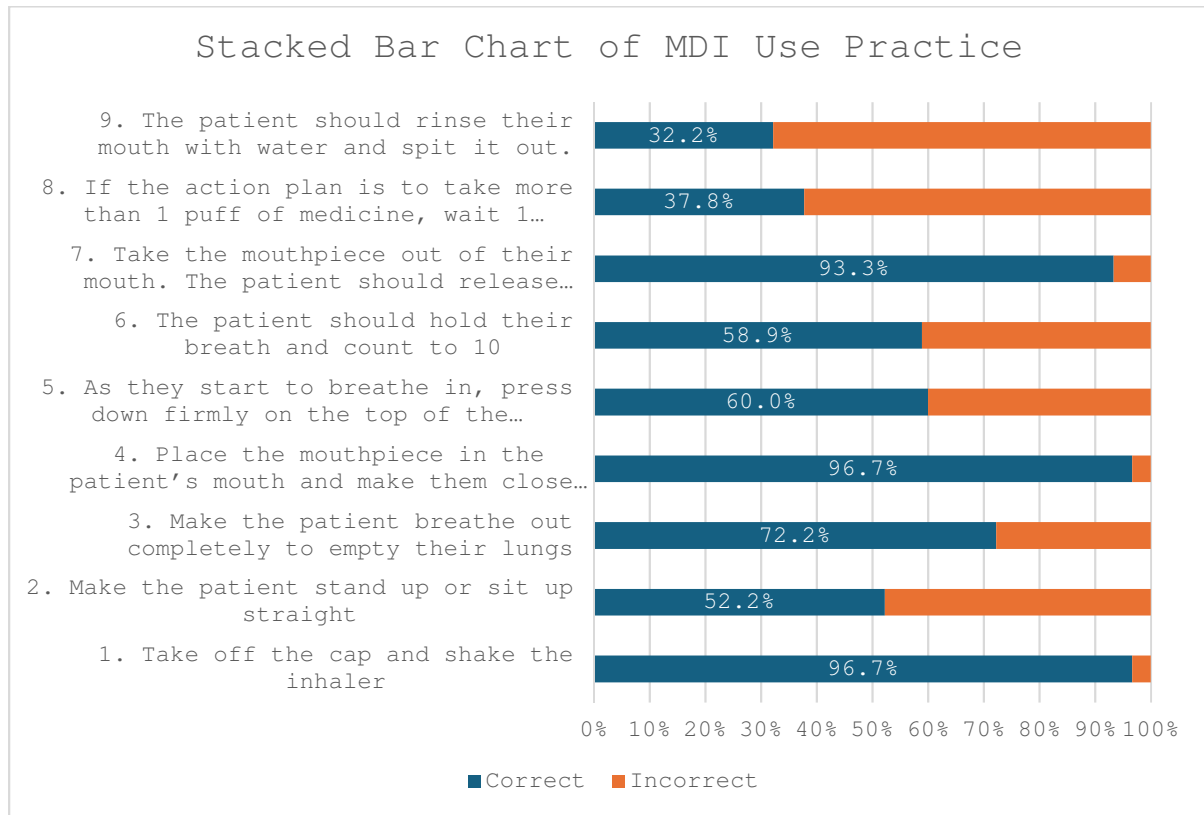
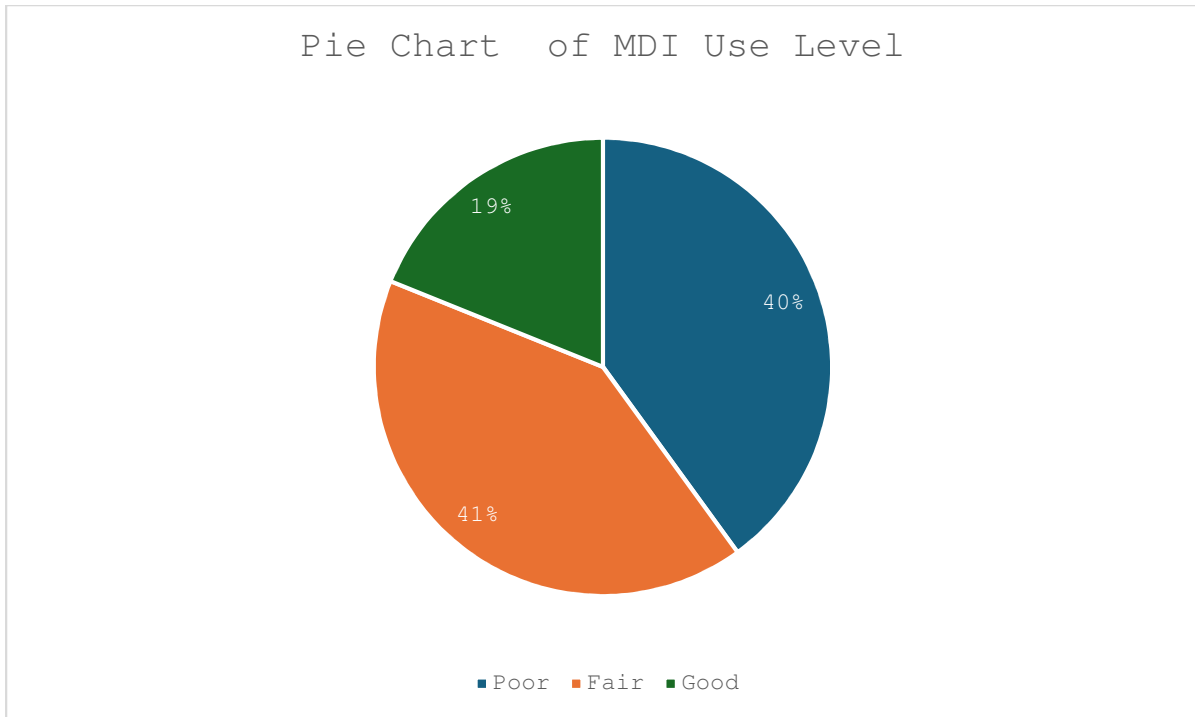


Figure 5: Stacked Bar Chart of MDI Use Practice

The interns were observed on their practice of MDI use by using a technique checklist, where it was observed if they were able to perform the essential steps of using an MDI correctly. Correctly performed steps were scored 1, while incorrectly performed steps were scored 0, after which the total score would be calculated by adding the sum of the score. The highest correct proportion from the steps, were step 1 “Take off the cap and shake the inhaler” and step 4 “Place the mouthpiece in the patient’s mouth and make them close their lips around it to form a tight seal”, both scored at 96.7%. The lowest correctly score proportion was step 9 “The patient should rinse their mouth with water and spit it out.” at 32.2%, with the next lowest score being step 8 “If the action plan is to take more than 1 puff of medicine, wait 1 minute between puffs. Repeat steps 2 through 7 for each puff” at 37.8%.



After the total score of the MDI use was calculated, the results were converted into a percentage that would be categorized into 3. Good practice if $\geq 80\%$, fair practice if 60–79%, and poor practice if $< 60\%$. Based on the category scoring system, 40% of the interns had poor practice in MDI use, 41.11% had fair practice, and 18.89% had good practice.

5.5 Practice of DPI Administration among Interns

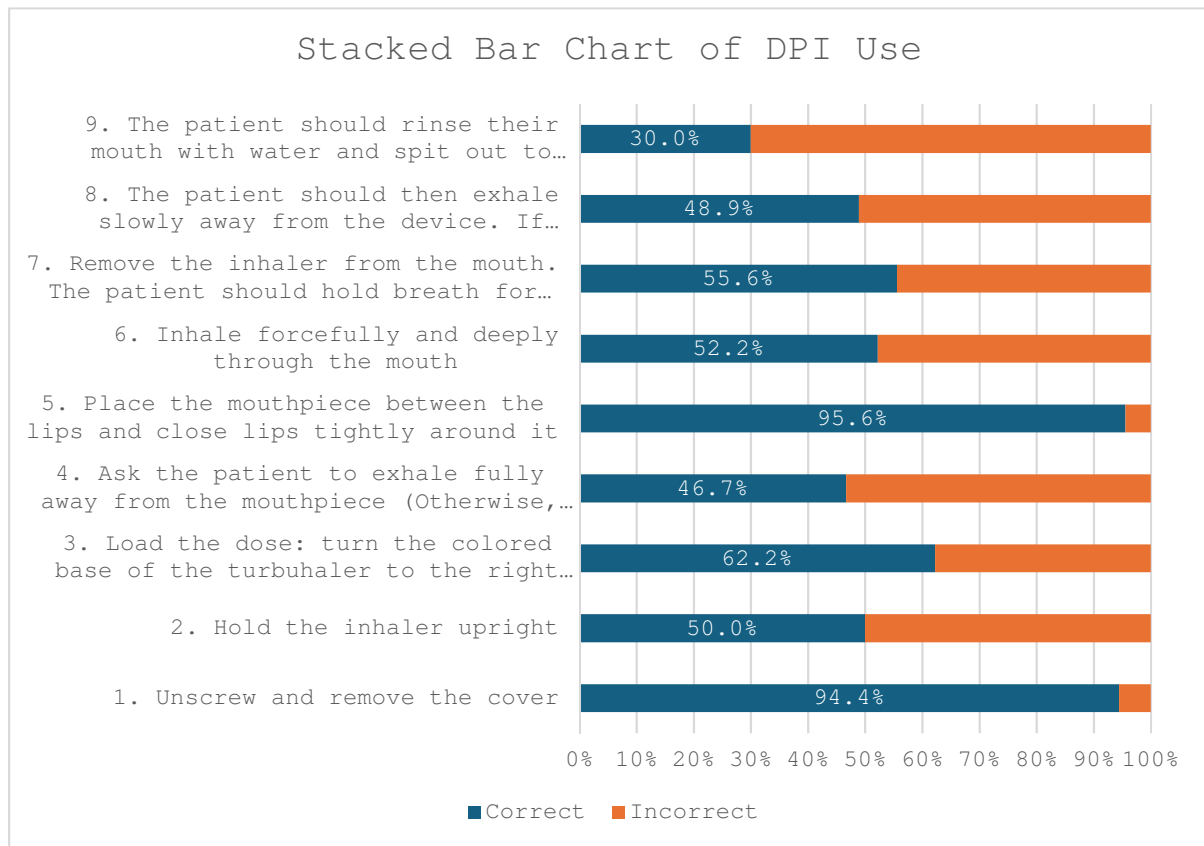


Figure 6: Stacked Bar Chart of DPI Use

The interns were observed on their practice of DPI use by using a technique checklist, where it was observed if they were able to perform the essential steps of using an DPI correctly. Correctly performed steps were scored 1, while incorrectly performed steps were scored 0, after which the total score would be calculated by adding the sum of the score. The highest correct proportion from the steps, were step 5 “Place the mouthpiece between the lips and close lips tightly around it” and step 1 “Unscrew and remove the cover”, scored at 95.6% and 94.4%. The lowest correctly score proportion was step 9 “The patient should rinse their mouth with water and spit it out.” at 30.0%, with the next lowest score being step 4 “Ask the patient to exhale fully away from the mouthpiece” at 46.7%. population at a single point in time. This identified the current gaps and can aid in planning for future interventions.

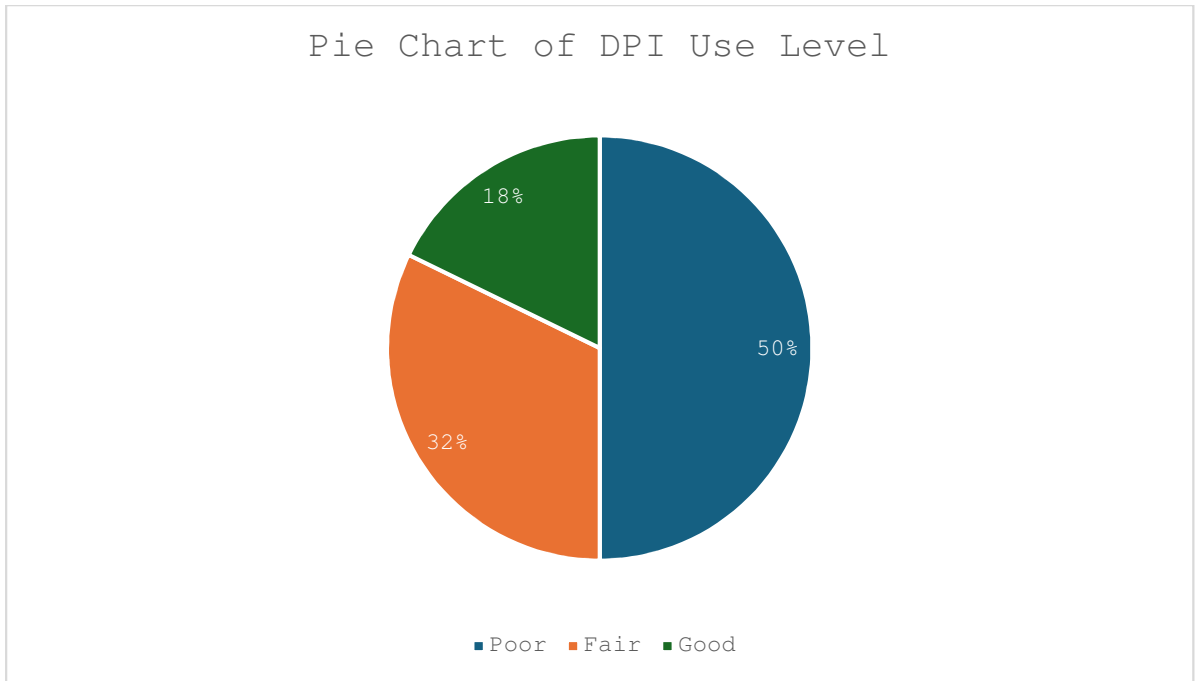


Figure 7: Pie Chart of DPI Use Level

After the total score of the DPI use was calculated, the results were converted into a percentage that would be categorized into 3. Good practice if $\geq 80\%$, fair practice if 60–79%, and poor practice if $< 60\%$. Based on the category scoring system, 50% of the interns had poor practice in DPI use, 32.22% had fair practice, and 17.78% had good practice.

5.6 Practice of Patient Education among the Interns

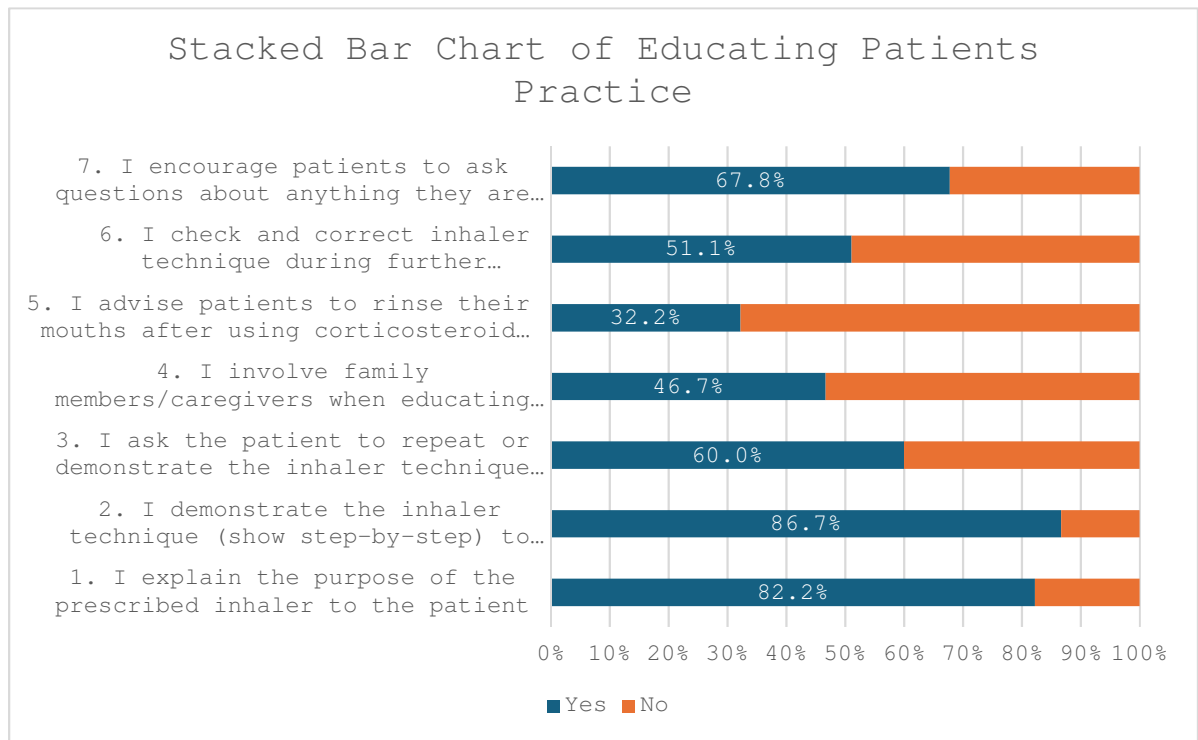


Figure 8: Stacked Bar Chart of Educating Patients Practice

The practice of educating patients on correct inhaler use was assessed via self-report practice questions, where “yes” and “no” questions were used to assess the prior practice of the interns when educating the patients. Questions answered “yes” scored 1, while questions answered “no” scored 0, after which the total score would be calculated by adding the sum of the score. The highest correct proportion from the questions, were question number 2 “I demonstrate the inhaler technique (show step-by-step) to every new patient” and question number 1 “I explain the purpose of the prescribed inhaler to the patient”, scored at 86.7% and 82.2%. The lowest correctly score proportion was question number 5 “I advise patients to rinse their mouths after using corticosteroid inhalers.” at 32.2%, with the next lowest score being question number 4 “I involve family members/caregivers when educating pediatric or dependent patients” at 46.7%.

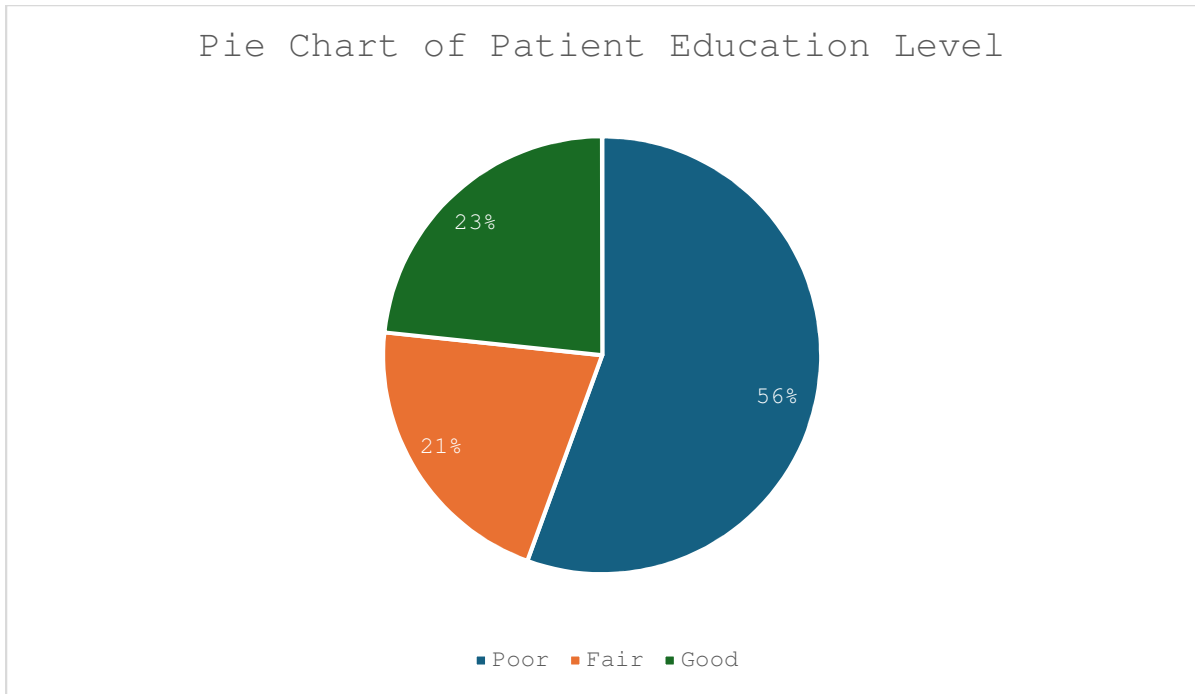


Figure 9: Pie Chart of Patient Education Level

After the total score of patient education practice use was calculated, the results were converted into a percentage that would be categorized into 3. Good practice if $\geq 80\%$, fair practice if 60–79%, and poor practice if $< 60\%$. Based on the category scoring system, 55.6% of the interns had poor practice in MDI use, 21.11% had fair practice, and 23.33% had good practice.

5.7 Association Between the Independent and Dependent Variables

Knowledge and Attitude level of the interns * MDI Use Level Crosstabulation							
		MDI Use Level			Chi-Square Test		
		Poor	Fair	Good	Pearson Chi-Square	df	p-value
Knowledge level of the interns	Poor	22(66.7%)	7(21.2%)	4(12.1%)	19.417	4	0.001
	Fair	11(34.4%)	16(50%)	5(15.6%)			
	Good	3(12%)	14(56%)	8(32%)			
Attitude level of the interns	Negative	1(33.3%)	0(0%)	2(66.7%)	6.358	4	0.174
	Neutral	8(53.3%)	5(33.3%)	2(13.3%)			
	Positive	27(37.5%)	32(44.4%)	17(18.9%)			

Table 3: Knowledge and Attitude level of the interns * MDI Use Level Crosstabulation

By interpreting the crosstabulation above, from the poor knowledge group, 66.7% had poor practice, while only 12.1% had good practice. From the fair knowledge group, 50% had fair practice. From the good knowledge group, 32% had good practice, with only 12% showing poor practice. There was a statistically significant association between knowledge level and MDI use practice among interns ($\chi^2 = 19.4$, $df = 4$, $p = 0.001$), indicating that improved knowledge is associated with better inhaler administration.

Although most interns had a positive attitude, this did not translate into better inhaler use practice. There was no statistically significant association was found between attitude category and MDI use practice ($\chi^2 = 6.358$, $df = 4$, $p = 0.174$). Despite a predominantly positive attitude, this did not correspond to improved inhaler technique practice.

Knowledge and Attitude level of the interns * DPI Use Level Crosstabulation							
		DPI Use Level			Chi-Square Test		
		Poor	Fair	Good	Pearson Chi-Square	df	p-value
Knowledge level of the interns	Poor	22(66.7%)	9(27.3%)	2(6.1%)	14.601	4	0.006
	Fair	15(46.9%)	13(40.6%)	4(12.5%)			
	Good	8(32%)	7(28%)	10(40%)			
Attitude level of the interns	Negative	1(33.3%)	1(33%)	1(33%)	6.214	4	0.184
	Neutral	11(73.3%)	1(6.7%)	3(20%)			
	Positive	33(45.8%)	27(37.5%)	12(16.7%)			

Table 4: Knowledge and Attitude level of the interns * DPI Use Level Crosstabulation

Knowledge level was significantly associated with DPI use practice among medical interns. Among interns with poor knowledge, 66.7% demonstrated poor practice, whereas 40.6% of those with fair knowledge demonstrated fair practice and 40.0% of those with good knowledge demonstrated good practice. The association between knowledge level and DPI practice was statistically significant ($\chi^2 = 14.6$, $df = 4$, $p = 0.006$), indicating that improved knowledge is associated with better DPI administration practice.

There was no statistically significant association was found with the attitude category ($\chi^2 = 6.214$, $df = 4$, $p = 0.184$). This shows that attitude alone is not sufficient to ensure correct practice.

Knowledge and Attitude level of the interns * Patient Education Level Crosstabulation							
		Education Level			Chi-Square Test		
		Poor	Fair	Good	Pearson Chi-Square	df	p-value
Knowledge level of the interns	Poor	24(72.7%)	3(9.1%)	6(18.2%)	15.38	4	0.004
	Fair	19(59.4%)	9(28.1%)	4(12.5%)			
	Good	7(28%)	7(28%)	11(44%)			
Attitude level of the interns	Negative	1(33.3%)	0(0%)	2(66.7%)	5.556	4	0.235
	Neutral	11(73.3%)	2(13.3%)	2(13.3%)			
	Positive	38(52.8%)	17(23.6%)	17(18.9%)			

Table 5: Knowledge and Attitude level of the interns * Patient Education Level Crosstabulation

Knowledge level was significantly associated with patient education practice among medical interns. Among interns with poor knowledge, 72.7% demonstrated poor practice, whereas 44.0% of those with good knowledge demonstrated good practice. The association between knowledge level and patient education practice was statistically significant ($\chi^2 = 15.380$, $df = 4$, $p = 0.004$), indicating that improved knowledge is associated with better patient education practice.

It is similarly seen in the table above that attitude level, despite its high level, had no significant statistical association with patient education practice ($\chi^2 = 5.556$, $df = 4$, $p = 0.235$).

6 Discussion

This study assessed the practice of inhaler administration and patient education among medical interns enrolled at Saint Paul's Hospital Millennium Medical College, 2017 E.C. It examined the sociodemographic factors of the 90 interns and how the knowledge and attitude of the interns affect their practices. The data suggests important gaps in knowledge regarding inhaler administration and education. The gaps in knowledge have associated implications in the clinical practice of the interns, despite there being generally positive attitudes.

In this study, more than one-third (36.7%) of the evaluated interns had poor knowledge. Although certain fundamental concepts, such as the importance of exhaling fully before inhaler use (82.2%) and the need to shake MDIs (74.4%) were relatively well understood, notable deficiencies were observed in areas related to dry powder inhalers (DPIs) and post-inhalation care, including breath-holding duration (55.6%) and mouth rinsing after corticosteroid use (58.9%). These findings show similar results to previous studies conducted among medical interns and healthcare professionals in other settings. For example, a study done here in Ethiopia reported that of 143 pediatrics providers, 57% had good knowledge compared to the 28% done here. The difference in knowledge could be attributed to the fact that the study consisted of also residents and nurses, who would likely have more experience in inhaler use. Though, there was a similar gap seen in breath holding duration on that study (54%) (Weldetsadik & Worku, 2024).

Most interns (80%) demonstrated a positive attitude regarding inhaler administration and patient education. Interns strongly agreed that proper inhaler technique is essential for effective asthma management and that educating patients is part of their professional responsibility, with mean attitudes of 4.42 and 4.29 respectively. There were relatively deficient areas regarding the intern's confidence in their ability to administer inhalers and educating patients on correct use at 3.53 and 3.30 respectively. While this finding is encouraging, the relatively low number of negative attitudes may be due to social desirability bias, as interns may provide responses they perceive as professionally acceptable. Importantly, despite this overwhelmingly positive attitude, no significant association was found between attitude and inhaler use practice or patient education practice. This suggests that positive attitude alone does not guarantee correct

clinical performance, reinforcing the idea that practical skills require structured training rather than motivation alone.

The observed practice of inhaler administration revealed substantial deficiencies. 40% of interns demonstrated poor MDI practice, and 50% demonstrated poor DPI practice, with those of good practice being 18.9% and 17.8% respectively. Critical steps such as waiting between puffs, exhaling away from the DPI mouthpiece, and rinsing the mouth after corticosteroid use were frequently missed (37.8%, 46.7%, and 30%). The particularly low adherence to mouth rinsing after corticosteroid inhalation is concerning, as it increases the risk of oral candidiasis and may negatively affect patient adherence. It was seen in a prior study done among 143 pediatrics providers, 66% showed adequate practice. The discrepancy in practice could be again explained due to the difference in experience of residents and nurses compared to interns alone. Though, there was a similar gap in waiting period between inhaler puffs (25%) (Weldetsadik & Worku, 2024). Studies done on Ethiopian pharmacists showed worse results for administering MDIs at 4.8 % in community drug retail outlets in Gondar town, northwest Ethiopia from March to May 2017 (Belachew et al., 2017) and 1.8% in pharmacies and drug stores in Mekelle Town, Ethiopia from March to June 2013 (Ali et al., 2014). These findings which consistently show that healthcare providers often omit essential inhaler steps despite being aware of their importance.

More than half of the interns (55.6%) demonstrated poor patient education practice. While most interns reported explaining the purpose of inhalers (82.2%) and demonstrating technique to new patients (86.7%), fewer consistently used teach-back methods (60%), involved caregivers (46.7%), or reinforced key preventive steps such as mouth rinsing (32.2%) and technique reassessment during follow-up visits (51.1%). A study among 70 undergraduates and residents at a tertiary hospital in Nepal, 2022 showed that only about 41% routinely educated patients on technique compared to their 79% and 82% of administration of DPIs and MDIs respectively. (Shrestha et al., 2022). This shows a gap between administration and comprehensive education.

A key finding of this study is the statistically significant association between knowledge and practice. The association was particularly substantial for MDI use ($\chi^2 = 19.4$, $df = 4$, $p = 0.001$).

There was also statistical association in DPI use ($\chi^2 = 14.6$, $df = 4$, $p = 0.006$) and patient education ($\chi^2 = 15.380$, $df = 4$, $p = 0.004$). The greater statistical significance for MDI practice than DPI could possibly be due to greater familiarity of interns with MDIs. In contrast, attitude was not significantly associated with practice, despite its generally positive level. This highlights that while favorable attitudes are necessary, they are insufficient without adequate knowledge and hands-on training. These findings emphasize that knowledge is important when skills-based performance is required.

The results of this study suggest that current training prior and during internship may not be sufficient to equip interns with the skills required for effective inhaler administration and patient education. The relatively better performance in MDI-related knowledge questions compared to DPI-related ones may show greater clinical exposure to MDIs during training and classes than with DPIs. The findings regarding patient education suggest that interns may prioritize task completion over patient-centered education, possibly due to time constraints, workload, or lack of structured expectations during clinical rotations.

7 Limitations of the Study

When considering the interpreted findings, we must also note some limitations. The study was done on a relatively small sample size, which may limit the generalizability. The Self-reported patient education practices may also be subject to recall and social desirability bias. Similarly, the attitude of the interns may be subject to social desirability bias. Despite these limitations, there were a number of strengths that were seen in the research. The use of direct observation for inhaler technique provided valuable insight into the practice of the interns and strengthens the validity of the practice assessment.

8 Conclusion and Recommendations

In conclusion, this study demonstrates that while medical interns at SPHMMC generally have positive attitudes toward inhaler use and patient education, significant gaps exist in knowledge and, more importantly, in practical skills. Knowledge was the strongest predictor of correct practice, whereas attitude alone was insufficient. Addressing these gaps through targeted, practical training interventions will help improve asthma care and patient outcomes in Ethiopia.

Incorporating structured, hands-on inhaler training, routine skill assessments, and supervised demonstrations into internship curricula could substantially improve practice. Additionally, ensuring access to inhaler devices for practice and emphasizing patient education as a core clinical skill may help bridge the observed gaps. Strengthening these areas could lead to better overall patient outcomes.

For future research on such topics, it is suggested to use a larger sample size and to incorporate multiple teaching hospitals for the research to enhance generalizability. An interventional study may be conducted to evaluate the effect of structured inhaler training on intern's knowledge and practice; a pre- and post-training assessment can be done. Future research should also examine the impact of improved intern inhaler techniques on patient outcomes such as asthma control, exacerbation frequency, and medication adherence.

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St. Paul's Hospital Millennium Medical college

**QUESTIONNAIRE FOR THE ASSESSMENT OF PRACTICE OF
ADMINISTRATION AND PROVIDING EDUCATION ON CORRECT USE OF
INHALERS TO ASTHMATIC PATIENTS AMONG SAINT PAUL'S MEDICAL
INTERNS**

My name is Bruck Melaku, a medical intern currently attaching in SPHMMC, Year 2017 E.C. As part of my academic requirement, I am conducting research on the assessment of Practice of Administration and providing education on correct use of inhalers to asthmatic patients among Saint Paul's medical interns.

This questionnaire was made to effectively assess and get additional information about the above research question. This information will be helpful in identifying any possible gaps that could be corrected.

The information obtained will be used for research purposes and your confidentiality is assured. I politely request your consent and cooperation to respond to this questionnaire. You may refuse to participate or withdraw at any stage without penalty or loss of benefits.

Do you voluntarily agree to participate?

☐ Yes

☐ No

Section 1: Socio-demographic and Background Information

1. Age: ____ in years
2. Sex:
☐ Male ☐ Female
3. Have you completed your Internal Medicine/ Emergency Medicine attachment:
☐ Yes ☐ No
4. Do you have any previous Formal Training in Inhaler Use:
☐ Yes ☐ No
5. Have you previously prescribed inhalers to patients?
☐ Yes ☐ No
6. Do you have access to inhaler devices for practice/demonstration?
☐ Yes ☐ No

Section 2: Knowledge

Please choose the best answer. Each correct answer will score 1 point.

1. What is the main purpose of using an inhaler in asthma treatment?
 - ☐ To relieve acute symptoms
 - ☐ To prevent future attacks
 - ☐ Both prevention and relief
 - ☐ I don't know
2. Why is it important to exhale fully before using an inhaler?
 - ☐ To clear the lungs for better medication deposition
 - ☐ To prevent coughing
 - ☐ To conserve the drug
 - ☐ I don't know
3. Which type of inhalers use a propellant to deliver the medication
 - ☐ Dry Powder Inhalers
 - ☐ Metered Dose Inhalers
 - ☐ Both
 - ☐ I don't know
4. Which of the following inhaler types requires the patient's forceful and quick inspiratory effort to deliver medication?
 - ☐ Dry Powder Inhaler (DPI)
 - ☐ Metered Dose Inhaler (MDI)
 - ☐ Both
 - ☐ I don't know
5. Why should MDIs be shaken before use?
 - ☐ To mix the medicine and propellant
 - ☐ To check how much medication is left in the inhaler
 - ☐ It has no use

- ☐ I don't know
6. How long should a patient hold their breath after inhaling the medication from an inhaler?
- ☐ 1–2 seconds
- ☐ 5–10 seconds
- ☐ 30 seconds
- ☐ I don't know
7. After using a corticosteroid inhaler, what should the patient do?
- ☐ Immediately eat
- ☐ Rinse mouth with water
- ☐ Lie down
- ☐ I don't know
8. What happens if the patient exhales into a Dry Powder Inhaler before inhaling?
- ☐ The medicine becomes clumped and ineffective
- ☐ The dose doubles
- ☐ Nothing happens
- ☐ I don't know
9. What is the formulation in the medication known as Symbicort?
- ☐ Salbutamol
- ☐ Budesonide and formoterol fumarate dihydrate
- ☐ Fluticasone and salmeterol
- ☐ I don't know
10. For Symbicort Turbuhaler, what action loads the dose?
- ☐ Pressing the canister
- ☐ Twisting the base grip back and forth
- ☐ Shaking the inhaler
- ☐ I don't know

Section 3: Attitude

Please indicate your level of agreement with the following statements. Choose the number that best represents your opinion, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

No.	Statement	1	2	3	4	5
1	I believe proper inhaler technique is essential for effective asthma management.	☐	☐	☐	☐	☐
2	Teaching patients how to use inhalers correctly is part of my professional responsibility.	☐	☐	☐	☐	☐
3	I feel confident in my ability to administer inhalers to treat conditions such as asthma.	☐	☐	☐	☐	☐
4	I feel confident in my ability to educate patients about the correct use of inhalers.	☐	☐	☐	☐	☐
5	Incorrect inhaler use is one of the major causes of poor asthma control.	☐	☐	☐	☐	☐
6	I think practical training on inhaler use should be mandatory during medical internship.	☐	☐	☐	☐	☐
7	I believe that asthma patients should be reassessed for their inhaler technique at every visit.	☐	☐	☐	☐	☐
8	Demonstrating inhaler use in front of patients increases their trust in healthcare providers.	☐	☐	☐	☐	☐

- 9 I am motivated to update my knowledge on inhaler techniques regularly. ☐ ☐ ☐ ☐ ☐
- 10 I believe interns should be more involved in treating asthma exacerbations ☐ ☐ ☐ ☐ ☐

Section 4: Dependent Variables - Practice

The following section of the questionnaire will be used by the examiner to evaluate the intern's practice in using inhalers

Practice of MDI Administration

No.	MDI administration Steps	Correct	Incorrect
1	Take off the cap and shake the inhaler		
2	Make the patient stand up or sit up straight		
3	Make the patient breathe out completely to empty their lungs		
4	Place the mouthpiece in the patient's mouth and make them close their lips around it to form a tight seal		
5	As they start to breathe in, press down firmly on the top of the medicine canister to release one "puff" of medicine. The patient should breathe in slowly for 3 to 5 seconds and take as big a breath as possible		
6	The patient should hold their breath and count to 10		
7	Take the mouthpiece out of their mouth. The patient should release their breath		
8	If the action plan is to take more than 1 puff of medicine, wait 1 minute between puffs. Repeat steps 2 through 7 for each puff		
9	The patient should rinse their mouth with water and spit it out. Rinsing will help to prevent an infection in the mouth such as oral thrush		

Practice of Symbicort Turbuhaler Administration

No.	Symbicort Turbuhaler steps	Correct	Incorrect
1	Unscrew and remove the cover		
2	Hold the inhaler upright		
3	Load the dose: turn the colored base of the turbuhaler to the right as far as it will go, then twist it back to the left until it clicks.		
4	Ask the patient to exhale fully away from the mouthpiece (Otherwise, the medicine becomes clumped and ineffective)		
5	Place the mouthpiece between the lips and close lips tightly around it		
6	Inhale forcefully and deeply through the mouth		
7	Remove the inhaler from the mouth. The patient should hold breath for about 10 seconds		
8	The patient should then exhale slowly away from the device. If another puff is prescribed, repeat from Step 3		
9	The patient should rinse their mouth with water and spit out to reduce the risk of oral thrush(How to Use a Turbuhaler, n.d.).		

The following section of the questionnaire will be used to assess the interns practice in educating patients about inhaler use

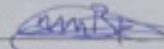
Practice of Educating on Inhaler Use

No.	Questions	Yes	No
1	I explain the purpose of the prescribed inhaler to the patient.		
2	I demonstrate the inhaler technique (show step-by-step) to every new patient.		
3	I ask the patient to repeat or demonstrate the inhaler technique back to me (teach-back).		
4	I involve family members/caregivers when educating pediatric or dependent patients.		
5	I advise patients to rinse their mouths after using corticosteroid inhalers.		
6	I check and correct inhaler technique during further exacerbations.		
7	I encourage patients to ask questions about anything they are unclear about their inhaler use.		

Declaration

I, the undersigned student, declare that this research project is my original work in partial fulfillment of the requirement for the **Degree of Doctor in Medicine**, MD. I also declare that it has never been presented in this or any other higher institution and that all resources and materials used in the research work have been duly acknowledged.

Name of the student: Bruck Melaku

Signature: 

Date: 25/03/26

Approval of Advisors

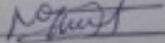
This research work has been submitted for examination with my approval.

Name of School of Public health advisor 1: Tolesa Diriba

Signature: 

Date: 25/03/2026

Name of Clinical advisor 2: Dr. Mirica Wondwosen

Signature: 

Date: 27/03/2026